United States Department of Agriculture,
Natural Resources Conservation Service

In cooperation with
University of Alaska Fairbanks
Agricultural and Forestry Experiment
Station and the State of Alaska
Department of Natural Resources

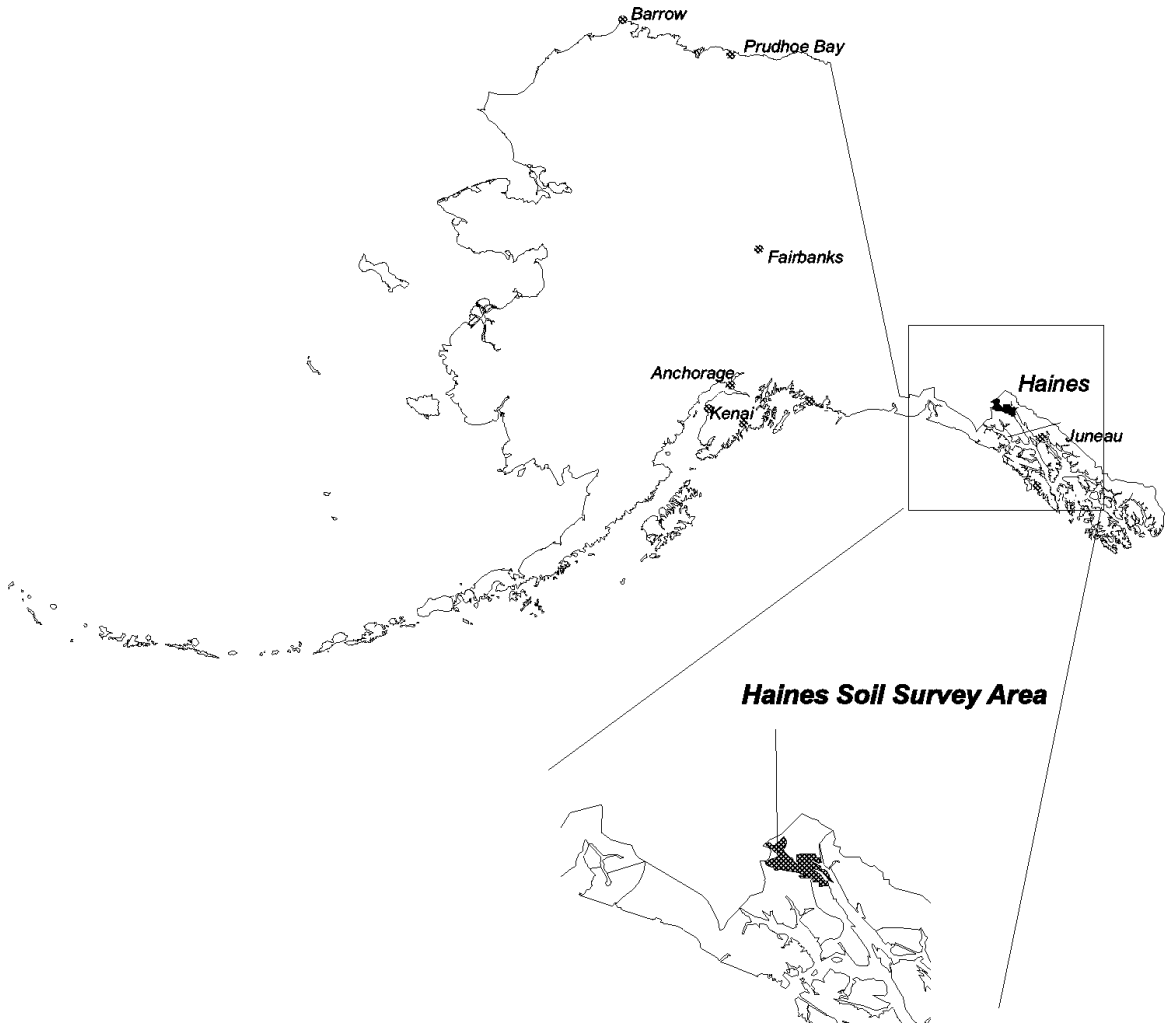
Soil Survey of Haines Area, Alaska

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture, State agencies including the Agricultural and Forestry Experiment Station, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1983. Soil names and descriptions were approved in 1985. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1983. This survey was made cooperatively by the Natural Resources Conservation Service, the University of Alaska Fairbanks Agricultural and Forestry Experiment Station, and the State of Alaska Department of Natural Resources. It is part of the technical assistance furnished to the Alaska Soil and Water Conservation District.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: The city of Haines. Krubate soils are in the center on outwash plains. Tolstoi and Foad soils are on the mountain sideslopes in the distance.



Location of the Haines Area, Alaska

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Foreword

This soil survey contains information that can be used in land-planning programs in the Haines Area, Alaska. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Foresters can use it to evaluate the potential of the soil and the management needed for maximum timber production. Planners, community officials, engineers, and others can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation and wildlife management can use the survey to help them understand, protect, and enhance the environment.

Many soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Alaska Cooperative Extension.

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Soil Survey of
Haines Area, Alaska

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the University of Alaska Fairbanks Agricultural and Forestry Experiment Station, and the State of Alaska Department of Natural Resources

National Cooperative Soil Survey has a system of

General Nature of the Survey Area

The Haines Area is located in the northern section of southeast Alaska, approximately 75 miles northwest of Juneau and 600 miles southeast of Anchorage, and has an area of about 334,525 acres, or 522 square miles.

The survey area is a mountainous region characterized by abundant glacier-related erosional and depositional features. It is irregular in shape, extending along the river valleys and adjacent mountainsides where human use is concentrated. Elevations range from sea level to over 5000 feet.

Soil scientists have identified approximately 21 different kinds of soil in the area. These soils have a wide range in texture, natural drainage, and other characteristics. The well drained soils on mountainsides and moraines support extensive stands of Sitka spruce and western hemlock; the poorly drained and somewhat poorly drained soils along floodplains generally support stands of black cottonwood; and the very poorly drained soils support mosses, sedges, and low growing shrubs.

This survey was made by field soil scientists and botanists. Quality control of the classification and mapping activities was provided by staffs of soil scientists from the state office and national technical center of the Natural Resources Conservation Service and by soil scientists of cooperating agencies. The correlation that ensures national uniformity and interpretative value. Soil correlation is a process that starts at the initiation of a soil survey and continues throughout the survey. Even after the survey is published, the correlation of the soils is reviewed at regular intervals and, where necessary, updated to be consistent with the latest information available.

The information in this publication was current at the time the manuscript was written in October 1984. Tables 1 through 12 were computer-generated from stored data maintained by the National Cooperative Soil Survey. The interpretative data in these tables were field tested during the soil survey and the tables have been modified as needed to incorporate the necessary changes that resulted from testing.

This published soil survey contains only part of the available soil information for the Haines Area. More detailed information can be obtained at the local office of the Natural Resources Conservation Service or the Alaska Cooperative Extension. The Agricultural and Forestry Experiment Station, University Libraries, and other State agencies may also have information.

"Soil Survey of the Haines Area" (*Schoephorster and Dixon 1976*), covers a part of the present survey. The present survey, however, updates the earlier survey and provides additional information and larger maps that show the soils in greater detail.

Climate

The climate of the survey area is predominantly maritime in character, with moderate temperatures and high precipitation occurring throughout the year. However, the climate of the survey area is drier than most of Southeast Alaska, with precipitation varying considerably over short distances due to rugged terrain and increasing distance from the exposed coastline.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Haines, Alaska. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season. Mean annual precipitation is about 50 inches (127 cm). The frost-free period in the vicinity of Haines averages 164 days, extending from early May to early October. This period varies greatly from year to year, and is estimated to be considerably less at other locations within the survey area.

Growing degree days are estimated to exceed 1500 in most years. A growing degree is equivalent to a "heat unit" available for plant growth. During the frost-free period, growing degree days accumulate by the amount that the average temperature each day exceeds the base temperature of 40 °F[1]. Limited climatic data of the Haines area makes it impossible to calculate the number of growing degree days of specific locations within the survey area.

An average of 123 inches (312 cm) of snow per season falls at Haines. Seasonal accumulations on the order of 300 inches (762 cm) are estimated at higher elevations. The prevailing winds are from the south and southeast during the summer, and from the west and northwest during the winter. However, wind velocities and direction vary considerably throughout the survey area due to the varying distance from the exposed coast, funneling effects of large ice fields and glaciers, and rugged terrain.

How This Survey Was Made

This survey provides information about the soils and miscellaneous areas in the survey area, including a description of the soils and miscellaneous areas and their location, and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of native plants; and the kinds of bedrock. They dug many holes to study the soil profile (the sequence of natural layers, or horizons, in a soil). The profile extends from the surface down into the material in which the soil formed. The material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with considerable accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size, and shape of soil aggregates; kind and amount of rock fragments; distribution of plant roots; soil reaction; and other features that enabled them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas. This allowed the scientists to confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and engineering tests. Soil scientists interpret the data from these analyses and

[1] 40 °F is the base temperature used for principal crops grown in Alaska. A base temperature of 50 °F is used in the conterminous U.S., so direct comparison of growing degree days is not valid.

tests, as well as the field-observed characteristics and the soil properties, to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested by observing the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. In addition, data are assembled from other sources such as research information, production records, and field experience of specialists.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with fairly high accuracy that a given soil will have a high water table within certain depths in most years. They cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, fields, roads, and rivers, which help in locating boundaries.

Because much of the area was inaccessible, helicopters were used to transport field personnel to and from, and within, the survey area. Soil observations, whether it be a pedon observation, traverse, or line transect, were planned to coincide with suitable landing sites. Muskegs, lake shores, gravel bars, and ridges usually afforded helicopter access. Since availability of suitable landing sites controlled access, the intensity of ground truth data versus air-photo interpretation varies widely over the survey area.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences result from a better knowledge of soils, modified series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Soil Map Units

The general soil map shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road, building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general map units in this survey have been grouped for broad interpretive purposes. Each of the map units is described on the following pages.

Map Unit Descriptions

1—Tolstoi-Foad-Rock Outcrop

Shallow and moderately deep, well drained soils formed in residuum and colluvium derived dominantly from metamorphic rocks; and rock outcrop

This map unit occurs on mountainsides. Slopes range from 5 to 100 percent. Drainageways are deeply dissected. The vegetation is mainly Sitka spruce and western hemlock. Elevation ranges from sea level to 3000 feet (914 m). Average annual precipitation ranges from 21 to 120 inches (53 to 305 cm).

This map unit makes up about 20 percent of the survey area. Tolstoi soils make up about 35 percent of the map unit, Foad soils 25 percent, and Rock outcrop 25 percent. The remaining 15 percent are soils of minor extent.

The sloping to extremely steep Tolstoi soils are shallow and well drained. The surface is covered with a mat of partially decomposed organic material. The mineral surface layer is silt loam. The upper part of the subsoil is gravelly silt loam, and the lower part is very gravelly silt loam and very cobbly silt loam. Schist bedrock is at a depth of about 19 inches (48 cm).

The sloping to extremely steep Foad soils are moderately deep and well drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is silt loam. The upper part of the subsoil is fine sandy loam, and the lower part is gravelly fine sandy loam. The substratum is very gravelly fine sandy loam. Schist bedrock is at a depth of about 23 inches (58 cm).

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Minor components in this unit are the well drained Kupreanof soils on mountainsides, the somewhat excessively drained Nataga soils on alluvial fans and toe slopes, poorly drained soils in depressions, and avalanche chutes.

The soils in this unit are mainly used for forestry, wildlife habitat, and recreation.

The main limitations for forestry are slope, depth to bedrock, and rock outcroppings.

2—Kupreanof-Foad

Very deep and moderately deep, well drained soils formed in residuum and colluvium derived dominantly from metamorphic rocks, or in glacial till

This map unit occurs on mountainsides and moraines. Slopes range from 5 to 100 percent. The vegetation is mainly Sitka spruce and western hemlock. Elevation ranges from sea level to 3000 feet (914 m). Average annual precipitation ranges from 21 to 120 inches (53 to 305 cm).

This map unit makes up about 12 percent of the survey area. Kupreanof soils make up about 50

percent of the map unit and Foad soils about 35 percent. The remaining 15 percent are soils of minor extent.

The sloping to extremely steep Kupreanof soils are very deep and well drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is silt loam. The upper part of the subsoil is gravelly sandy loam and very gravelly coarse sandy loam. The substratum is very cobbly sandy loam to a depth of 60 inches (152 cm) or more.

The sloping to extremely steep Foad soils are moderately deep and well drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is silt loam. The upper part of the subsoil is fine sandy loam, and the lower part is gravelly fine sandy loam. The substratum is very gravelly fine sandy loam. Schist bedrock is at a depth of about 23 inches (58 cm).

Minor components in this unit are the well drained Lutak soils on terraces, Nataga soils on alluvial fans and toe slopes, Tolstoi soils on mountainsides, and poorly drained soils in depressions. Other minor components are avalanche chutes and rock outcroppings.

The soils in this unit are mainly used for forestry, wildlife habitat, and recreation.

The main limitations for forestry are slope and depth to bedrock.

3—Cryorthents-Lithic Cryofolists-Rock Outcrop

Very shallow to very deep, moderately well drained and well drained soils formed in residuum and colluvium derived dominantly from metamorphic rocks, or in organic deposits derived from sphagnum moss; and rock outcrop

This map unit occurs on mountainsides. Slopes range from 20 to 180 percent. The vegetation is highly variable depending on physiographic conditions, but includes Sitka spruce, western hemlock, lodgepole pine, and paper birch. Elevation ranges from sea level to 4000 feet (1219 m). Average annual precipitation ranges from 21 to 120 inches (53 to 305 cm).

This map unit makes up about 14 percent of the survey area. Composition is highly variable depending upon the location within the survey area.

The steep to extremely steep Cryorthents range from very shallow to very deep and are moderately well drained and well drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is gravelly silt loam. The underlying material is gravelly coarse sandy loam. Metamorphic rock is at a depth of about 12 inches (30 cm). The soil properties vary widely over short distances.

The steep to extremely steep Lithic Cryofolists are very shallow and shallow, and well drained. This soil consists of fibric and hemic organic material. Bedrock is at a depth of about 10 inches (25 cm).

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Minor components in this unit are the well drained Foad, Kupreanof, and Tolstoi soils on mountainsides. Other minor components include poorly drained soils in depressions.

The soils in this unit are mainly used for wildlife habitat and recreation.

4—Glaciers-Rock Outcrop-Ferebee

Glaciers, rock outcrop, and very shallow and shallow, well drained soils formed in residuum and colluvium derived dominantly from metamorphic rocks

This map unit occurs on upper mountainsides and mountaintops. Slopes range from 5 to 180 percent. The vegetation consists of lichens and moss. Elevation ranges from 2800 to more than 4500 feet (853 to more than 1372 m). Average annual precipitation ranges from 120 to more than 300 inches (305 to more than 762 cm).

This map unit makes up about 34 percent of the survey area. Glaciers and rock outcrop make up about 55 percent of the map unit and Ferebee soils about 30 percent. The remaining 15 percent are soils of minor extent.

Glaciers are large masses of ice that formed from the continuous accumulation, compaction, and recrystallization of snow. The glaciers move from the upper mountainslopes down through the upper mountain valleys.

Rock outcrop consists of areas of exposed metamorphic rock and granite.

The sloping to very steep Ferebee soils are very shallow and shallow, and well drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is gravelly silt loam. The subsurface layer is very cobbly silt loam. The subsoil is extremely cobbly silt loam. Metamorphic rock is at a depth of about 12 inches (30 cm).

Minor components in this unit are the well drained Foad, Kupreanof, and Tolstoi soils on mountainsides. Other minor components include poorly drained soils in depressions.

The soils in this unit are mainly used for wildlife habitat.

5—Nataga-Lutak

Very deep, somewhat excessively drained and well drained soils formed in very cobbly alluvium and colluvium, or in eolian material overlying glaciofluvial deposits

This map unit is on alluvial fans, outwash plains, toe slopes, and stream terraces. Slopes range from 0 to 40 percent. The vegetation is mainly Sitka spruce, western hemlock, and black cottonwood. Elevation ranges from sea level to 1700 feet (518 m). Average annual precipitation ranges from 21 to 65 inches (53 to 165 cm).

This map unit makes up about 5 percent of the survey area. Nataga soils make up about 55 percent of the map unit and Lutak soils about 30 percent. The remaining 15 percent are soils of minor extent.

The sloping to steep Nataga soils are very deep and somewhat excessively drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is gravelly sandy loam. The underlying material is very cobbly loamy sand and extremely cobbly loamy sand to a depth of 60 inches (152 cm) or more.

The sloping to steep Lutak soils are very deep and well drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is silt loam. The subsoil is sandy loam and loamy sand. The substratum is very gravelly loamy sand to a depth of 60 inches (152 cm) or more.

Minor components in this unit are the well drained Kupreanof soils on mountainslopes, poorly drained soils in depressions, ponded areas, and riverwash.

The soils in this unit are mainly used for forestry, wildlife habitat, and recreation.

The main limitation for forestry is slope.

6—Krubate-Typic Haplocryods-Histic Cryaquepts

Very deep to moderately deep, well drained, poorly drained and very poorly drained soils formed in glaciofluvial deposits and colluvium

This map unit occurs on outwash plains. Slopes range from 0 to 70 percent. The vegetation is mainly Sitka spruce and western hemlock. Elevation ranges from sea level to 800 feet (244 m). Average annual precipitation ranges from 55 to 65 inches (140 to 165 cm).

This map unit makes up about 3 percent of the survey area. Krubate soils make up about 35 percent of the map unit, Typic Haplocryods about 30 percent, and Histic Cryaquepts about 20 percent. The remaining 15 percent are soils of minor extent.

The sloping to very steep Krubate soils are very deep and well drained. The surface is covered with stones and a mat of partially decomposed organic matter. The mineral surface layer is gravelly sandy loam. The upper part of the subsoil is very gravelly coarse sandy loam and the lower part is very gravelly loamy coarse sand. The substratum is very gravelly loamy coarse sand to a depth of 60 inches (152 cm) or more.

The sloping to steep Typic Haplocryods are very deep and well drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface is silt loam. The subsoil and substratum are silt loam to a depth of 60 inches (152 cm) or more. Soil properties vary widely over short distances.

The sloping to steep Histic Cryaquepts are moderately deep to very deep and very poorly drained and poorly drained. The surface is covered with a thick mat of partially decomposed organic matter. The mineral surface is mucky silt loam. The subsoil is gravelly silt loam to a depth of 60 inches (152 cm) or more. Soil properties vary widely over short distances.

Minor components in this unit are the well drained Foad, Kupreanof, and Tolstoi soils on mountainsides.

The soils in this unit are mainly used for forestry, wildlife habitat, and recreation.

The main limitations for forestry are stones on the surface, slope, and depth to water table.

7—Hollow-Skagway-Funter

Very deep, somewhat poorly drained and very poorly drained soils formed in alluvium, and in fibrous organic material underlain by loamy sediments

This map unit occurs on floodplains. Slopes range from 0 to 5 percent. The vegetation is mainly black cottonwood and sphagnum moss. Elevation ranges from sea level to 1000 feet (305 m). Average annual precipitation ranges from 21 to 65 inches (53 to 165 cm). These soils are subject to frequent flooding.

This map unit makes up about 7 percent of the survey area. Hollow soils make up about 35 percent of the map unit, Skagway soils about 30 percent, and Funter soils about 20 percent. The remaining 15 percent are soils of minor extent.

The nearly level Hollow soils are very deep and somewhat poorly drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is gravelly sandy loam. The underlying material is very gravelly sand and extremely

gravelly sand stratified with thin layers of silt to a depth of 60 inches (152 cm) or more.

The nearly level Skagway soils are very deep and somewhat poorly drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is fine sandy loam. The underlying material is loamy fine sand to a depth of 60 inches (152 cm) or more.

The nearly level Funter soils are very deep and very poorly drained. Funter soils occur in muskegs. The surface layer is sphagnum moss to a depth of about 42 inches (107 cm). The underlying material is silt to a depth of 60 inches (152 cm) or more.

Minor components in this map unit are the well drained Lutak soils on stream terraces, the somewhat poorly drained Tsirku soils on floodplains, and ponded areas.

The soils in this unit are mainly used for forestry, wildlife habitat, and recreation.

The main limitations for forestry are flooding and depth to water table.

8—Chilkoot

Very deep, very poorly drained and poorly drained soils formed in alluvium

This map unit occurs on floodplains. Slopes range from 0 to 5 percent. The vegetation is mainly black cottonwood and Sitka spruce. Elevation ranges from sea level to 800 feet (244 cm). Average annual precipitation ranges from 55 to 65 inches (140 to 165 cm). These soils are subject to frequent flooding.

This map unit makes up about 2 percent of the survey area. Chilkoot soils make up about 85 percent of the map unit. The remaining 15 percent are soils of minor extent.

The nearly level Chilkoot soils are very deep and poorly drained to very poorly drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is silt. The underlying material is loamy fine sand to a depth of 60 inches (152 cm) or more. Depth to water table fluctuates between 0 and 20 inches (0 to 51 cm). In some profiles the water table has dropped below 20 inches (51 cm) due to altered drainage resulting from stream incisement.

Minor components in this unit are the very poorly drained Funter soils in muskegs, the well drained Lutak soils on stream terraces, and the somewhat excessively drained Nataga soils on toe slopes.

The soils in this unit are mainly used for forestry, wildlife habitat, and recreation.

The main limitations for forestry are flooding and depth to water table.

9—Ashmun-Funter-Hollow

Very deep, very poorly drained and somewhat poorly drained soils formed in alluvium, and in fibrous organic material underlain by loamy sediments

This map unit occurs on floodplains. Slopes range from 0 to 5 percent. The vegetation is mainly black cottonwood.

Elevation ranges from sea level to 1000 feet (305 m). Average annual precipitation ranges from 21 to 65 inches (53 to 165 cm). These soils are subject to frequent flooding.

This map unit makes up about 3 percent of the survey area. Ashmun soils make up about 35 percent of the map unit, Funter soils about 25 percent, and Hollow soils about 25 percent. The remaining 15 percent are soils of minor extent.

The nearly level Ashmun soils are very deep and very poorly drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is silt loam. The upper part of the underlying material is loamy fine sand, and the lower part is sandy to a depth of 60 inches (152 cm) or more.

The nearly level Funter soils are very deep and very poorly drained. Funter soils occur in muskegs. The surface layer is sphagnum moss to a depth of about 42 inches (107 cm). The underlying material is silt to a depth of 60 inches (152 cm) or more.

The nearly level Hollow soils are very deep and somewhat poorly drained. The surface is covered with a mat of partially decomposed organic matter. The mineral surface layer is gravelly sandy loam. The underlying material is very gravelly sand and extremely gravelly sand stratified with thin lenses of silt to a depth of 60 inches (152 cm) or more.

Minor components in this map unit are the well drained Lutak soils on stream terraces, the somewhat poorly drained Skagway and Tsirku soils on floodplains, and ponded areas.

The soils in this unit are mainly used for forestry, wildlife habitat, and recreation.

The main limitations for forestry are flooding and depth to water table.

Detailed Soil Map Units

The map units delineated on the detailed maps enclosed with this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under "Use and Management of the Soils" (page 75).

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed. Consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for developing resource plans, but if intensive use of small areas is planned, on-site investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Many of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Chilkoot, moderately wet, is a phase of the Chilkoot series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Tolstoi-Foad complex, 5 to 20 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Skagway-Funter association, 0 to 5 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Hollow and Skagway soils, 0 to 5 percent slopes, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rubbleland is an example.

This survey was mapped at more than one level of intensity. Soils having major forest types of commercial importance were mapped in more detail. Black cottonwood forests on floodplains and tundra areas above timberline were mapped in less detail. Access to remote areas also determined the amount of survey detail. However, all map units were designed to meet the needs of the user.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables," page vi) give properties of the soils and the limitations, capabilities, and potentials for many uses. Scientific names of plants mentioned in the descriptions are given in Table 13. The glossary (page 111) defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

101—Ashmun-Funter association, 0 to 5 percent slopes

Composition

Ashmun and similar inclusions: 45 percent
Funter and similar inclusions: 40 percent
Contrasting inclusions: 15 percent

Characteristics of Ashmun Soil

Position on landscape: floodplains and outwash plains
Slope range: 0 to 5 percent
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: black cottonwood

Typical profile:
*0 to 1 inch (0 to 3 cm)—very dark brown silt loam
*1 to 7 inches (3 to 18 cm)—very dark grayish brown loamy fine sand
*7 to 21 inches (18 to 53 cm)—very dark gray sand, few fine prominent dark brown mottles
*21 to 60 inches (53 to 152 cm)—very dark gray sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly drained
Permeability: in the upper part—moderate; below 1 inch (3 cm)—rapid
Available water capacity: moderate
Root-restricting features: water table
Runoff: slow
Hazard of erosion: slight
Depth to high water table: 0 to 18 inches (0 to 46 cm)
Hazard of flooding: frequent—April to September

Characteristics of Funter Soil

Position on landscape: floodplains
Microtopography: muskegs
Slope range: 0 to 5 percent
Slope features: concave
Native vegetation: sphagnum moss

Typical profile:
*0 to 12 inches (0 to 30 cm)—light olive brown sphagnum peat
*12 to 24 inches (30 to 61 cm)—light yellowish brown peat
*24 to 42 inches (61 to 107 cm)—dark brown peat
*42 to 60 inches (107 to 152 cm)—grayish brown silt

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly drained
Permeability: in the upper part—assumed to be rapid; below 42 inches (107 cm)—moderate
Available water capacity: very high
Root-restricting features: water table
Runoff: very slow
Hazard of erosion: slight
Depth to water table: 0 to 12 inches (0 to 30 cm)
Hazard of flooding: frequent—April to September

Included Areas

Contrasting inclusions:
*gravel bars and riverwash
*very gravelly soils on adjacent floodplains
*ponded areas

Major Uses

Current uses: wildlife habitat, forestry, and recreation

Major Management Factors

Soil-related factors: flooding and depth to water table
Elevation: 0 to 1000 feet (0 to 305 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Ashmun Soil)

Principal tree species: black cottonwood
Common forest understory plants: Sitka alder, meadow horsetail, highbush cranberry, red-osier dogwood, arctic starflower, sweet scented bedstraw, and twisted-stalk
Habitat type (Viereck and Dyrness 1982): black cottonwood/Sitka alder-highbush cranberry
Mean site index (50-year site curve) for stated species: black cottonwood—77 (*British Columbia Forest Service 1977*)
Estimated highest average production for stated species (and source): black cottonwood—35 cubic feet/acre/year at 60 years (*British Columbia Forest Service 1977*)

Operability considerations:
*The main physical limitations to harvesting are frequent flooding and a high water table.
*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a severe degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install culverts or other drainage structures to improve road utility and reduce the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil displacement.

Silvicultural considerations:
*Frequent flooding and a high water table reduce the survival of planted or natural seedlings.
*If seed trees are present, natural regeneration of black cottonwood occurs readily.
*Because rooting depth is restricted by the high water table, trees are frequently subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can prevent the establishment of seedlings.

Suitable management practices:
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.

Forestry (Funter Soil)

This soil does not support forestland vegetation.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, beaver, bald eagles, and a variety of other birds and mammals.

102—Ashmun-Hollow-Funter complex, 0 to 5 percent slopes

Composition

Ashmun and similar inclusions: 55 percent
Hollow and similar inclusions: 15 percent
Funter and similar inclusions: 15 percent
Contrasting inclusions: 15 percent

Characteristics of Ashmun Soil

Position on landscape: floodplains and outwash plains
Slope range: 0 to 5 percent
Slope features: plane
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: black cottonwood

Typical profile:
*0 to 1 inch (0 to 3 cm)—very dark brown silt loam
*1 to 7 inches (3 to 18 cm)—very dark grayish brown loamy fine sand
*7 to 21 inches (18 to 53 cm)—very dark gray sand, few fine prominent dark brown mottles
*21 to 60 inches (53 to 152 cm)—very dark gray sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly drained
Permeability: in the upper part—moderate; below 1 inch (3 cm)—rapid
Available water capacity: moderate
Root-restricting features: water table
Runoff: slow
Hazard of erosion: slight
Depth to high water table: 0 to 18 inches (0 to 46 cm)
Hazard of flooding: frequent—April to September

Characteristics of Hollow Soil

Position on landscape: floodplains and outwash plains
Slope range: 0 to 5 percent
Slope features: plane
Organic mat on surface: 1 inch (3 cm) thick
Native vegetation: black cottonwood

Typical profile:
*0 to 1 inch (0 to 3 cm)—dark brown gravelly sandy loam
*1 to 16 inches (3 to 41 cm)—dark grayish brown very gravelly sand stratified with thin lenses of silt
*16 to 60 inches (41 to 152 cm)—dark grayish brown extremely gravelly sand stratified with thin lenses of silt

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat poorly drained
Permeability: in the upper part—moderate; below 1 inch (3 cm)—rapid
Available water capacity: very low
Root-restricting features: water table
Runoff: slow
Hazard of erosion: slight
Depth to water table: in May through August—18 to 30 inches (46 to 76 cm); rest of year—below 40 inches (102 cm)
Hazard of flooding: frequent—April to September

Characteristics of Funter Soil

Position on landscape: floodplains
Microtopography: muskegs
Slope range: 0 to 5 percent
Slope features: concave
Native vegetation: sphagnum moss

Typical profile:
*0 to 12 inches (0 to 30 cm)—light olive brown sphagnum peat
*12 to 24 inches (30 to 61 cm)—light yellowish brown peat
*24 to 42 inches (61 to 107 cm)—dark brown peat
*42 to 60 inches (107 to 152 cm)—grayish brown silt

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly drained
Permeability: in the upper part—assumed to be rapid; below 42 inches (107 cm)—moderate
Available water capacity: very high
Root-restricting features: water table
Runoff: very slow
Hazard of erosion: slight
Depth to water table: 0 to 12 inches (0 to 30 cm)
Hazard of flooding: frequent—April to September

Included Areas

Contrasting inclusions:
*gravel bars and riverwash
*ponded areas
*gravel pits

Major Uses

Current uses: wildlife habitat, forestry, and recreation

Major Management Factors

Soil-related factors: flooding and depth to water table
Elevation: 0 to 1000 feet (0 to 305 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Ashmun Soil)

Principal tree species: black cottonwood
Common forest understory plants: Sitka alder, meadow horsetail, highbush cranberry, red-osier dogwood, arctic starflower, sweet scented bedstraw, and twisted-stalk
Habitat type (Viereck and Dyrness 1982): black

cottonwood/Sitka alder-highbush cranberry

Mean site index (50-year site curve) for stated species: black cottonwood—77 (*British Columbia Forest Service 1977*)

Estimated highest average production for stated species (and source): black cottonwood—35 cubic feet/acre/year at 60 years (*British Columbia Forest Service 1977*)

Operability considerations:

*The main physical limitations to harvesting are frequent flooding and a high water table.

*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.

*Displacement of the surface layer can be expected to a severe degree from improper or repeated use of equipment.

*Surface erosion from unprotected, bared areas can be expected to a slight degree.

*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:

*Use conventional wheeled and tracked equipment for harvesting.

*Install culverts or other drainage structures to improve road utility and reduce the cost of road maintenance.

*Overlay roads with gravel to support repeated, long-term use.

*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil displacement.

Silvicultural considerations:

*Frequent flooding and a high water table reduce the survival of planted or natural seedlings.

*If seed trees are present, natural regeneration of black cottonwood occurs readily.

*Because rooting depth is restricted by the high water table, trees are frequently subject to windthrow when the soil is wet and winds are strong.

*When openings are made in the canopy, invading brushy plants, if not controlled, can prevent the establishment of seedlings.

Suitable management practices:

*Salvage harvest blowdown promptly to reduce wood loss to decay.

*Control unwanted, competing vegetation by mechanical or chemical means.

Forestry (Hollow Soil)

Principal tree species: black cottonwood

Tree species of limited extent: Sitka spruce

Common forest understory plants: Sitka alder, one-sided wintergreen, liver-leaf wintergreen, highbush cranberry, bluntseed sweetroot, red-osier dogwood, horsetail, and sweet-scented bedstraw

Habitat types (Viereck and Dyrness 1982): black cottonwood/Sitka alder-highbush cranberry

Mean site index (50-year site curve) for stated species: black cottonwood—73 (*British Columbia Forest Service 1977*)

Estimated highest average production for stated species (and source): black cottonwood—35 cubic feet/acre/year at age 60 (*British Columbia Forest Service 1977*)

Operability considerations:

*The main physical limitations to harvesting are frequent flooding and a seasonal high water table.

*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.

*Displacement of the surface layer can be expected to a severe degree from improper or repeated use of equipment.

*Surface erosion from unprotected, bared areas can be expected to a slight degree.

*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:

*Use conventional wheeled and tracked equipment for harvesting.

*Install culverts or other drainage structures to improve road utility and reduce the cost of road maintenance.

*Overlay roads with gravel to support repeated, long-term use.

*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil displacement.

Silvicultural considerations:

*Frequent flooding and a high water table reduce the survival of planted or natural seedlings.

*If seed trees are present, natural regeneration of black cottonwood occurs readily.

*Because rooting depth is restricted by the periodic high water table, trees are occasionally subject to windthrow when the soil is wet and winds are strong.

*When openings are made in the canopy, invading brushy plants, if not controlled, can prevent the establishment of seedlings.

Suitable management practices:

*Salvage harvest blowdown promptly to reduce wood

loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.

Forestry (Funter Soil)

This soil does not support forestland vegetation.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, beaver, bald eagles, and a variety of other birds and mammals.

103—Beaches

Position on landscape: shores

This map unit consists of non-vegetated or sparsely vegetated areas between the high tide line and the forest vegetation. The material consists of unsorted clay, silt, sand, gravel, cobble, and stones. Slope ranges from 0 to 5 percent.

104—Chilkoot-Chilkoot, moderately wet association, 0 to 5 percent slopes

Composition

Chilkoot and similar inclusions: 45 percent
Chilkoot, moderately wet, and similar inclusions: 40 percent
Contrasting inclusions: 15 percent

Characteristics of Chilkoot Soil

Position on landscape: floodplains
Slope range: 0 to 5 percent
Slope features: plane
Organic mat on surface: 3 inches (8 cm) thick
Native vegetation: sedges and willows

Typical profile:
*0 to 5 inches (0 to 13 cm)—olive gray silt
*5 to 60 inches (13 to 152 cm)—olive gray and dark gray loamy fine sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly drained
Permeability: in the upper part—moderate; below 5 inches (13 cm)—rapid
Available water capacity: moderate
Root-restricting features: water table
Runoff: slow
Hazard of erosion: slight
Depth to water table: 0 to 12 inches (0 to 30 cm)
Hazard of flooding: frequent—April to September

Characteristics of Chilkoot, moderately wet soil

Position on landscape: floodplains
Slope range: 0 to 5 percent
Slope features: plane
Organic mat on surface: 3 inches (8 cm) thick
Native vegetation: Sitka spruce

Typical profile:
*0 to 5 inches (0 to 13 cm)—olive gray silt
*5 to 60 inches (13 to 152 cm)—olive gray and dark gray loamy fine sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: poorly drained
Permeability: in the upper part—moderate; below 5 inches (13 cm)—rapid
Available water capacity: moderate
Root-restricting features: water table
Runoff: slow
Hazard of erosion: slight
Depth to water table: in May through August—12 to 24 inches (30 to 61 cm); rest of year—24 to 40 inches (61 to 102 cm)
Hazard of flooding: frequent—April to September

Included Areas

Contrasting inclusions:
*gravel bars and riverwash
*very gravelly soils on adjacent floodplains
*ponded areas

Major Uses

Current uses: wildlife habitat, forestry, and recreation

Major Management Factors

Soil-related factors: flooding and depth to water table
Elevation: 0 to 800 feet (0 to 244 m)

Climatic factors (average annual):
*precipitation—55 to 65 inches (140 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Chilkoot Soil)

This soil does not support forestland vegetation.

Forestry (Chilkoot, moderately wet soil)

Principal tree species: Sitka spruce
Tree species of limited extent: black cottonwood and western hemlock
Common forest understory plants: devil's club, early blueberry, highbush cranberry, five-leaf bramble, pyrola, twisted-stalk, meadow horsetail, rusty menziesia, and bunchberry dogwood
Habitat types (Viereck and Dyrness 1982): Sitka spruce/early blueberry-highbush cranberry/moss and Sitka spruce/devil's club-rusty menziesia/moss
Mean site index (100-year site curve) for stated species (and source): Sitka spruce—90 (*Meyer 1937*) and 93 (*Taylor 1934*)
Estimated highest average production for stated species (and source): Sitka spruce—105 cubic feet/acre/year at age 70 (*Meyer 1937*) and 95 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is frequent flooding.
*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install culverts or other drainage structures to improve road utility and reduce the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.

Silvicultural considerations:
*Frequent flooding reduces the survival of planted or naturally established seedlings.
*If seed trees are present, natural regeneration of Sitka spruce, black cottonwood and western hemlock occurs readily.
*Because rooting depth is restricted by the seasonal water table, trees are frequently subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can prevent the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Replace mortality to fully occupy the site.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, beaver, bald eagles, and a variety of other birds and mammals.

105—Cryorthents, 20 to 180 percent slopes

Composition

Cryorthents: 75 percent
Included soils: 25 percent

Characteristics of Cryorthents

Position on landscape: mountainsides
Microtopography: avalanche chutes
Slope range: 20 to 180 percent
Slope features: steep to extremely steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka alder, western hemlock, cottonwood, lodgepole pine, Sitka spruce, and birch

Sample profile:
*0 to 5 inches (0 to 13 cm)—very dark gray gravelly silt loam
*5 to 12 inches (13 to 30 cm)—dark brown and dark grayish brown coarse sandy loam
*12 inches (30 cm)—fractured metamorphic rock grading into consolidated bedrock

Depth class: very shallow to very deep—7 to more than 60 inches (18 to more than 152 cm) over bedrock
Drainage class: moderately well to well drained
Permeability: moderate to moderately rapid
Available water capacity: very low to moderate
Root-restricting features: bedrock
Runoff: rapid to very rapid
Hazard of erosion: severe

Included Soils

Included are soils with properties that vary widely over short distances. These include very shallow to deep, poorly drained to well drained soils on mountainsides, footslopes, and low-lying areas bordering mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite, with an admixture of sphagnum moss, glacial till, and loess.

Major Uses

Current uses: wildlife habitat and recreation

Major Management Factors

Soil-related factors: slope and depth to bedrock
Elevation: 0 to 4000 feet (0 to 1219 m)
Climatic factors (average annual):
*precipitation—21 to 200 inches (53 to 508 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

106—Ferebee-Rock outcrop complex, 5 to 90 percent slopes

Composition

Ferebee and similar inclusions: 50 percent
Rock outcrop: 40 percent
Contrasting inclusions: 10 percent

Characteristics of Ferebee Soil

Position on landscape: mountainsides and mountaintops
Slope range: 5 to 90 percent
Slope features: plane to extremely steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: ericaceous shrubs, mosses, and lichens
Rock fragments on surface: 20 percent gravel

Typical profile:
*0 to 3 inches (0 to 8 cm)—black gravelly silt loam
*3 to 8 inches (8 to 20 cm)—very dark brown very cobbly silt loam
*8 to 12 inches (20 to 30 cm)—dark brown extremely cobbly silt loam
*12 inches (30 cm)—fractured metamorphic rock grading into consolidated bedrock

Depth class: very shallow to shallow—7 to 14 inches (18 to 36 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 3 inches (8 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: medium to very rapid
Hazard of erosion: severe

Characteristics of Rock Outcrop

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Included Areas

*soils in depressions that are poorly drained
*steep-walled V-notch drainages
*avalanche chutes
*ice and snow

Major Uses

Current uses: recreation and wildlife habitat

Major Management Factors

Soil-related factors: rock outcroppings, slope, and depth to bedrock
Elevation: 2800 to 4500 feet (853 to 1372 m)
Climatic factors (average annual):
*precipitation—120 to more than 300 inches (305 to more than 762 cm)
*air temperature—33 to 35 °F (1 to 2 °C)
*growing degree days—less than 300

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, mountain goat, and a variety of other birds and mammals.

107—Foad-Kupreanof complex, 70 to 100 percent slopes

Composition

Foad and similar inclusions: 55 percent
Kupreanof and similar inclusions: 30 percent
Contrasting inclusions: 15 percent

Characteristics of Foad Soil

Position on landscape: mountainsides
Slope range: 70 to 100 percent
Slope features: extremely steep
Organic mat on surface: 6 inches (15 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 3 inches (0 to 8 cm)—very dark grayish brown silt loam
*3 to 5 inches (8 to 13 cm)—dark reddish brown very cobbly silt loam
*5 to 30 inches (13 to 76 cm)—reddish brown extremely cobbly silt loam
*30 inches (76 cm)—fractured schist over consolidated schist

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep—20 to 40 inches (51 to 102 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 3 inches (8 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: very rapid
Hazard of erosion: severe

Characteristics of Kupreanof Soil

Position on landscape: moraines and mountainsides
Slope range: 70 to 100 percent
Slope features: extremely steep
Organic mat on surface: 3 inches (8 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 1 inch (0 to 3 cm)—dark reddish brown silt loam
*1 to 7 inches (3 to 18 cm)—dark brown gravelly sandy loam
*7 to 9 inches (18 to 23 cm)—dark yellowish brown gravelly sandy loam
*9 to 60 inches (23 to 152 cm)—very dark grayish brown very gravelly sandy loam

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below 9 inches (23 cm)—moderately rapid
Available water capacity: low
Runoff: very rapid
Hazard of erosion: severe

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 100 percent
*soils in depressions that are poorly drained
*steep-walled V-notch drainages
*avalanche chutes
*rock outcroppings

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: depth to bedrock and slope
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Foad Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: devil's club, early blueberry, bunchberry dogwood, rusty menziesia, one-sided wintergreen, highbush cranberry, red-osier dogwood, five-leaf bramble, liver-leaf wintergreen, twisted-stalk, trifoliate foam flower, prickly currant, nagoonberry, and spinulose shield-fern
Habitat types (Viereck and Dyrness 1982): western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/devil's club- rusty menziesia
Mean site index (100-year site curve) for stated species (and source): western hemlock—90 (*Barnes 1962*); Sitka spruce—90 (*Meyer 1937*) and 89 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—105 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka

spruce—104 cubic feet/acre/year at age 70 (*Meyer 1937*) and 98 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is steep slopes.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use cable yarding systems for harvesting. Systems that fully or partially suspend logs off the ground are less damaging to the soil.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.
*Because rooting depth is restricted by bedrock, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Forestry (Kupreanof Soil)

Principal tree species: western hemlock and Sitka spruce
Tree species of limited extent: paper birch
Common forest understory plants: bunchberry dogwood, one-sided wintergreen, liver-leaf wintergreen, devil's club, trifoliate foam flower, five-leaf bramble, oakfern, early blueberry, rattlesnake plantain, highbush cranberry, spinulose shield-fern, and twisted-stalk
Habitat types (Viereck and Dyrness 1982): Sitka spruce/early blueberry-highbush cranberry/moss, Sitka-spruce/Sitka alder-highbush cranberry, western hemlock/devil's club-rusty menziesia, and western hemlock/early blueberry-rusty menziesia
Mean site index (100-year site curve) for stated species (and source): western hemlock—93 (*Barnes 1962*); Sitka spruce—92 (*Meyer 1937*) and 94 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—112 cubic feet/acre/year/at age 87 (*Barnes 1962*); Sitka spruce—93 cubic feet/acre/year at age 70 (*Meyer 1937*) and 96 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is steep slopes.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use cable yarding systems for harvesting. Systems that fully or partially suspend logs off the ground are less damaging to the soil.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

108—Funter peat, 0 to 5 percent slopes

Composition

Funter and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Characteristics of Funter Soil

Position on landscape: floodplains and terraces
Microtopography: muskegs
Slope range: 0 to 5 percent
Slope features: concave
Native vegetation: sphagnum moss

Typical profile:
*0 to 12 inches (0 to 30 cm)—light olive brown sphagnum peat
*12 to 24 inches (30 to 61 cm)—light yellowish brown peat
*24 to 42 inches (61 to 107 cm)—dark brown peat
*42 to 60 inches (107 to 152 cm)—grayish brown silt

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly drained
Permeability: in the upper part—assumed to be rapid; below 42 inches (107 cm)—moderate
Available water capacity: very high
Root-restricting features: water table
Runoff: very slow
Hazard of erosion: slight
Depth to water table: 0 to 12 inches (0 to 30 cm)
Hazard of flooding: frequent—April to September

Included Areas

Contrasting inclusions:
*ponded areas
*soils in muskegs that do not have a mineral substratum within 51 inches (130 cm)
*gravel bars and riverwash
*very gravelly soils on adjacent slopes

Major Uses

Current uses: wildlife habitat and recreation

Major Management Factors

Soil-related factors: flooding and depth to water table
Elevation: 0 to 1000 feet (0 to 305 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, beaver, bald eagles, and a variety of other birds and mammals.

109—Histic Cryaquepts, 0 to 20 percent slopes

Composition

Histic Cryaquepts: 75 percent
Included soils: 25 percent

Characteristics of Histic Cryaquepts

Position on landscape: mountainsides and outwash plains
Microtopography: low-lying areas, muskegs, and depressions
Slope range: 0 to 20 percent
Slope features: concave
Organic mat on surface: 9 inches (23 cm) thick
Native vegetation: Sitka spruce, western hemlock, black cottonwood, and lodgepole pine

Sample profile:
*9 to 5 inches (23 to 13 cm)—decomposed moss, roots, and forest litter
*5 inches to 0 (13 cm to 0)—partially decomposed roots and moss
*0 to 4 inches (0 to 10 cm)—black mucky silt loam
*4 to 10 inches (10 to 25 cm)—dark grayish brown and very dark gray gravelly silt loam
*10 to 60 inches (25 to 152 cm)—dark grayish brown and light yellowish brown very cobbly silt loam

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep to very deep—20 to more than 60 inches (51 to more than 152 cm) over bedrock
Drainage class: very poorly to poorly drained
Permeability: moderately slow to moderately rapid
Available water capacity: low to high
Root-restricting features: water table and bedrock
Runoff: slow to medium
Hazard of erosion: slight
Depth to water table: 0 to 20 inches (0 to 51 cm)

Included Soils

Included are soils with properties that vary widely over short distances. These include shallow to very deep, well drained soils on adjacent mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite along with an admixture of organic deposits.

Major Uses

Current uses: wildlife habitat, recreation, forestry, and urban uses

Major Management Factors

Soil-related factors: depth to bedrock and depth to water table
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, western hemlock, lodgepole pine, and black cottonwood

Operability considerations:
*Tree species and associated production are highly variable depending on physiographic conditions.
*The main physical limitation to harvesting is a high water table.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

Urban Uses

Some areas of this map unit are used for homesite development. The main limitations are wetness and steepness of slope. An on-site investigation is required to determine suitability for development.

110—Hollow and Skagway soils, 0 to 5 percent slopes

Composition

Hollow, Skagway, and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Characteristics of Hollow Soil

Position on landscape: floodplains and outwash plains
Slope range: 0 to 5 percent
Slope features: plane
Organic mat on surface: 1 inch (3 cm) thick
Native vegetation: black cottonwood

Typical profile:
*0 to 1 inch (0 to 3 cm)—dark brown gravelly sandy loam
*1 to 16 inches (3 to 41 cm)—dark grayish brown very gravelly sand stratified with thin lenses of silt
*16 to 60 inches (41 to 152 cm)—dark grayish brown extremely gravelly sand stratified with thin lenses of silt

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat poorly drained
Permeability: in the upper part—moderate; below 1 inch (3 cm)—rapid
Available water capacity: very low
Root-restricting features: water table
Runoff: slow
Hazard of erosion: slight
Depth to water table: in May through August—18 to 30 inches (46 to 76 cm); rest of year—below 40 inches (102 cm)
Hazard of flooding: frequent—April to September

Characteristics of Skagway Soil

Position on landscape: floodplains and outwash plains
Slope range: 0 to 5 percent

Slope features: plane
Organic mat on surface: 4 inches (10 cm) thick
Native vegetation: black cottonwood

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark brown fine sandy loam
*2 to 17 inches (5 to 43 cm)—dark grayish brown and yellowish brown loamy fine sand
*17 to 60 inches (43 to 152 cm)—dark grayish brown loamy fine sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat poorly drained
Permeability: in the upper part—moderate; below 2 inches (5 cm)—rapid
Available water capacity: very low
Root-restricting features: water table
Runoff: slow
Hazard of erosion: slight
Depth to water table: in May through August—18 to 30 inches (46 to 76 cm); rest of year—below 40 inches (102 cm)
Hazard of flooding: frequent—April to September

Included Areas

Contrasting inclusions:
*poorly drained organic soils in muskegs
*gravel bars and riverwash
*ponded areas
*gravel pits

Major Uses

Current uses: wildlife habitat, forestry, and recreation

Major Management Factors

Soil-related factors: flooding and depth to water table
Elevation: 0 to 1000 feet (0 to 305 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: black cottonwood
Tree species of limited extent: Sitka spruce
Common forest understory plants: Sitka alder, one-sided wintergreen, liver-leaf wintergreen, highbush cranberry, bluntseed sweetroot, red-osier dogwood, horsetail, and sweet-scented bedstraw
Habitat types (Viereck and Dyrness 1982): black cottonwood/Sitka alder-highbush cranberry
Mean site index (50-year site curve) for stated species: Hollow—black cottonwood—73 (*British Columbia Forest Service 1977*); Skagway—black cottonwood—80 (*British Columbia Forest Service 1977*)
Estimated highest average production for stated species (and source): black cottonwood—35 cubic feet/acre/year at age 60 (*British Columbia Forest Service 1977*)

Operability considerations:
*The main physical limitations to harvesting are frequent flooding and a seasonal high water table.
*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a severe degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install culverts or other drainage structures to improve road utility and reduce the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil displacement.

Silvicultural considerations:
*Frequent flooding and a seasonal high water table reduce the survival of planted or naturally established seedlings.
*If seed trees are present, natural regeneration of black cottonwood occurs readily.
*Because rooting depth is restricted by the periodic high water table, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can prevent the establishment of seedlings.

Suitable management practices:
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, beaver, bald eagles, and a variety of other birds and mammals.

111—Krubate gravelly sandy loam, 5 to 20 percent slopes, extremely stony

Composition

Krubate and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Characteristics of Krubate Soil

Position on landscape: outwash plains
Slope range: 5 to 20 percent
Slope features: sloping to steep
Native vegetation: Sitka spruce and western hemlock
Organic mat on surface: 1 inch (3 cm) thick
Rock fragments on surface: 5 percent stones

Typical profile:
*0 to 3 inches (0 to 8 cm)—gray gravelly sandy loam
*3 to 5 inches (8 to 13 cm)—brown very gravelly coarse sandy loam
*5 to 11 inches (13 to 28 cm)—reddish brown very gravelly loamy coarse sand
*11 to 16 inches (28 to 41 cm)—reddish brown and strong brown very gravelly loamy coarse sand
*16 to 24 inches (14 to 61 cm)—dark brown and strong brown very gravelly loamy coarse sand
*24 to 60 inches (61 to 152 cm)—dark brown and dark grayish brown very gravelly loamy coarse sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below 5 inches (13 cm)—moderately rapid
Available water capacity: low
Runoff: medium
Hazard of erosion: slight

Included Areas

Contrasting inclusions:
*soils on adjacent slopes that have more than 5 percent stones on the surface
*soils that have slopes of more than 20 percent
*soils in depressions that are poorly drained
*gravel pits

Major Uses

Current uses: wildlife habitat, recreation, forestry, and urban uses

Major Management Factors

Soil-related factors: stones on the surface
Elevation: 0 to 800 feet (0 to 244 m)
Climatic factors (average annual):
*precipitation—55 to 65 inches (140 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Krubate Soil)

Principal tree species: Sitka spruce and western hemlock
Tree species of limited extent: paper birch
Common forest understory plants: devil's club, oakfern, rattlesnake plantain, bunchberry dogwood, early blueberry, single delight, highbush cranberry, rusty menziesia, one-sided wintergreen, twisted-stalk, bristly black currant, and alpine ladyfern
Habitat types (Viereck and Dyrness 1982): Sitka spruce-western hemlock/early blueberry-highbush cranberry/moss
Mean site index (100-year site curve) for stated species (and source): western hemlock—79 (*Barnes 1962*); Sitka spruce—98 (*Meyer 1937*) and 102 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—85 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—117 cubic feet/acre/year at age 70 (*Meyer 1937*) and 118 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*Surface stones hinder harvesting operations.
*The main physical limitation to harvesting is soil wetness in spring.
*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.

*Displacement of the surface layer can be expected to a slight degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.

Silvicultural considerations:
*If seed trees are present, natural regeneration of Sitka spruce and western hemlock occurs periodically.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

Urban Uses

Some areas of this map unit are used for homesite development. Slopes greater than 15 percent present a severe limitation. An on-site investigation is required to determine suitability for development.

112—Krubate gravelly sandy loam, 20 to 40 percent slopes, extremely stony

Composition

Krubate and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Characteristics of Krubate Soil

Position on landscape: outwash plains
Slope range: 20 to 40 percent
Slope features: steep
Native vegetation: Sitka spruce and western hemlock
Organic mat on surface: 1 inch (3 cm) thick
Rock fragments on surface: 5 percent stones

Typical profile:
*0 to 3 inches (0 to 8 cm)—gray gravelly sandy loam
*3 to 5 inches (8 to 13 cm)—brown very gravelly coarse sandy loam
*5 to 11 inches (13 to 28 cm)—reddish brown very gravelly loamy coarse sand
*11 to 16 inches (28 to 41 cm)—reddish brown and strong brown very gravelly loamy coarse sand
*16 to 24 inches (41 to 61 cm)—dark brown and strong brown very gravelly loamy coarse sand
*24 to 60 inches (61 to 152 cm)—dark brown and dark grayish brown very gravelly loamy coarse sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below 5 inches (13 cm)—moderately rapid
Available water capacity: low
Runoff: rapid
Hazard of erosion: slight

Included Areas

Contrasting inclusions:
*soils on adjacent slopes that have more than 5 percent stones on the surface
*soils that have slopes of more than 40 percent
*soils in depressions that are poorly drained
*gravel pits

Major Uses

Current uses: wildlife habitat, recreation, forestry, and urban uses

Major Management Factors

Soil-related factors: stones on the surface and slope
Elevation: 0 to 800 feet (0 to 244 m)
Climatic factors (average annual):
*precipitation—55 to 65 inches (140 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Krubate Soil)

Principal tree species: Sitka spruce and western hemlock

Tree species of limited extent: paper birch
Common forest understory plants: devil's club, oakfern, rattlesnake plantain, bunchberry dogwood, early blueberry, single delight, highbush cranberry, rusty menziesia, one-sided wintergreen, twisted-stalk, bristly black currant, and alpine ladyfern
Habitat types (Viereck and Dyrness 1982): Sitka spruce-western hemlock/early blueberry-highbush cranberry/moss
Mean site index (100-year site curve) for stated species (and source): western hemlock—79 (*Barnes 1962*); Sitka spruce—98 (*Meyer 1937*) and 102 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—85 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—117 cubic feet/acre/year at age 70 (*Meyer 1937*) and 118 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitations to harvesting are steep slopes and wet soils in spring.
*Surface stones hinder harvesting operations.
*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a slight degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil compaction, puddling, displacement, and erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs periodically.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

Urban Uses

Some areas of this map unit are used for homesite development. The main limitation is steepness of slope. An on-site investigation is required to determine suitability for development.

113—Krubate gravelly sandy loam, 40 to 70 percent slopes, extremely stony

Composition

Krubate extremely stony sandy loam and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Characteristics of Krubate Soil

Position on landscape: outwash plains
Slope range: 40 to 70 percent
Slope features: very steep
Native vegetation: Sitka spruce and western hemlock
Organic mat on surface: 1 inch (3 cm) thick
Rock fragments on surface: 5 percent stones

Typical profile:
*0 to 3 inches (0 to 8 cm)—gray gravelly sandy loam
*3 to 5 inches (8 to 13 cm)—brown very gravelly coarse sandy loam
*5 to 11 inches (13 to 28 cm)—reddish brown very gravelly loamy coarse sand
*11 to 16 inches (28 to 41 cm)—reddish brown and strong brown very gravelly loamy coarse sand

*16 to 24 inches (41 to 61 cm)—dark brown and strong brown very gravelly loamy coarse sand
*24 to 60 inches (61 to 152 cm)—dark brown and dark grayish brown very gravelly loamy coarse sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below 5 inches (13 cm)—moderately rapid
Available water capacity: low
Runoff: rapid
Hazard of erosion: severe

Included Areas

Contrasting inclusions:
*soils on adjacent slopes that have more than 5 percent stones on the surface
*soils that have slopes of more than 70 percent
*soils in depressions that are poorly drained
*rock outcroppings

Major Uses

Current uses: wildlife habitat, recreation, forestry, and urban uses

Major Management Factors

Soil-related factors: stones on the surface and slope
Elevation: 0 to 800 feet (0 to 244 m)
Climatic factors (average annual):
*precipitation—55 to 65 inches (140 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Krubate Soil)

Principal tree species: Sitka spruce and western hemlock
Tree species of limited extent: paper birch
Common forest understory plants: devil's club, oakfern, rattlesnake plantain, bunchberry dogwood, early blueberry, single delight, highbush cranberry, rusty menziesia, one-sided wintergreen, twisted-stalk, bristly black currant, and alpine ladyfern
Habitat types (Viereck and Dyrness 1982): Sitka spruce-western hemlock/early blueberry-highbush cranberry/moss
Mean site index (100-year site curve) for stated species (and source): western hemlock—79 (*Barnes 1962*); Sitka spruce—98 (*Meyer 1937*) and 102 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—85 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—117 cubic feet/acre/year at age 70 (*Meyer 1937*) and 118 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is steep slopes.
*Surface stones hinder harvesting operations.
*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use cable yarding systems for harvesting. Systems that fully or partially suspend logs off the ground are less damaging to the soil.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs periodically.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

Urban Uses

Some areas of this map unit are used for homesite development. The main limitation is steepness of slope. An on-site investigation is required to determine suitability for development.

114—Krubate Variant, 0 to 20 percent slopes

Composition

Krubate Variant and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Characteristics of Krubate Variant

Position on landscape: outwash plains
Microtopography: low-lying areas and depressions
Slope range: 0 to 20 percent
Slope features: concave to steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce, western hemlock, black cottonwood, and lodgepole pine

Sample profile:
*0 to 3 inches (0 to 8 cm)—black silt loam
*3 to 5 inches (8 to 13 cm)—dark gray silt loam
*5 to 6 inches (13 to 15 cm)—black silt loam
*6 to 12 inches (15 to 30 cm)—dark reddish brown very gravelly coarse sandy loam
*12 to 22 inches (30 to 56 cm)—very dark grayish brown extremely gravelly loamy coarse sand
*22 to 60 inches (56 to 152 cm)—dark olive gray extremely gravelly loamy coarse sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly to poorly drained
Permeability: in the upper part—moderate; below 6 inches (15 cm)—rapid
Available water capacity: low to moderate
Root-restricting features: water table
Runoff: slow to medium
Hazard of erosion: slight
Depth to water table: 0 to 18 inches (0 to 46 cm)

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 20 percent

Major Uses

Current uses: wildlife habitat, recreation, and forestry

Major Management Factors

Soil-related factors: depth to water table
Elevation: 0 to 800 feet (0 to 244 m)
Climatic factors (average annual):
*precipitation— 55 to 65 inches (140 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, paper birch, western hemlock, and lodgepole pine

Operability considerations:
*Tree species and production are highly variable depending on physiographic conditions.
*The main physical limitation to harvesting is a high water table.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

115—Kupreanof-Foad complex, 2 to 20 percent slopes

Composition

Kupreanof and similar inclusions: 50 percent
Foad and similar inclusions: 35 percent
Contrasting inclusions: 15 percent

Characteristics of Kupreanof Soil

Position on landscape: moraines and mountainsides
Slope range: 2 to 20 percent
Slope features: plane to steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 3 inches (0 to 8 cm)—dark gray silt loam
*3 to 8 inches (8 to 20 cm)—dark reddish brown

gravelly sandy loam
*8 to 13 inches (20 to 33 cm)—dark reddish brown very gravelly coarse sandy loam
*13 to 22 inches (33 to 56 cm)—dark brown very gravelly coarse sandy loam
*22 to 60 inches (56 to 152 cm)—dark brown very cobbly sandy loam

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: low
Runoff: slow to medium
Hazard of erosion: slight

Characteristics of Foad Soil

Position on landscape: mountainsides
Slope range: 5 to 20 percent
Slope features: plane to steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 4 inches (5 to 10 cm)—dark yellowish brown fine sandy loam
*4 to 8 inches (10 to 20 cm)—dark brown gravelly fine sandy loam
*8 to 23 inches (20 to 58 cm)—olive brown very gravelly fine sandy loam
*23 inches (58 cm)—fractured schist over consolidated schist

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep—20 to 40 inches (51 to 102 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: medium
Hazard of erosion: slight

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 20 percent
*soils in depressions that are poorly drained
*soils on adjacent sideslopes that have bedrock at a depth of less than 20 inches (51 cm)
*steep-walled V-notch drainages
*avalanche chutes
*rock outcroppings

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: depth to bedrock
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Kupreanof Soil)

Principal tree species: western hemlock and Sitka spruce
Tree species of limited extent: paper birch
Common forest understory plants: bunchberry dogwood, one-sided wintergreen, liver-leaf wintergreen, devil's club, trifoliate foam flower, five-leaf bramble, oakfern, early blueberry, rattlesnake plantain, highbush cranberry, spinulose shield-fern, and twisted-stalk
Habitat types (Viereck and Dyrness 1982): Sitka spruce/early blueberry-highbush cranberry/moss, Sitka-spruce/Sitka alder-highbush cranberry, western hemlock/devil's club-rusty menziesia, and western hemlock/early blueberry-rusty menziesia
Mean site index (100-year site curve) for stated species (and source): western hemlock—93 (*Barnes 1962*); Sitka spruce—92 (*Meyer 1937*) and 94 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—112 cubic feet/acre/year/at age 87 (*Barnes 1962*); Sitka spruce—93 cubic feet/acre/year/at age 70 (*Meyer 1937*) and 96 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is snowmelt in spring.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.

*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil compaction and displacement.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Forestry (Foad Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: devil's club, early blueberry, bunchberry dogwood, rusty menziesia, one-sided wintergreen, highbush cranberry, red-osier dogwood, five-leaf bramble, liver-leaf wintergreen, twisted-stalk, trifoliate foam flower, prickly currant, nagoonberry, and spinulose shield-fern
Habitat types (Viereck and Dyrness 1982): western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/devil's club-rusty menziesia
Mean site index (100-year site curve) for stated species (and source): western hemlock—90 (*Barnes 1962*); Sitka spruce—90 (*Meyer 1937*) and 89 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—105 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—104 cubic feet/acre/year at age 70 (*Meyer 1937*) and 98 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is snowmelt in spring.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of compaction, puddling, and displacement.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.
*Because rooting depth is restricted by bedrock, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

116—Kupreanof-Foad complex, 20 to 40 percent slopes

Composition

Kupreanof and similar inclusions: 50 percent
Foad and similar inclusions: 35 percent
Contrasting inclusions: 15 percent

Characteristics of Kupreanof Soil

Position on landscape: moraines and mountainsides
Slope range: 20 to 40 percent
Slope features: steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 3 inches (0 to 8 cm)—dark gray silt loam
*3 to 8 inches (8 to 20 cm)—dark reddish brown gravelly sandy loam
*8 to 13 inches (20 to 33 cm)—dark reddish brown very gravelly coarse sandy loam
*13 to 22 inches (33 to 56 cm)—dark brown very gravelly coarse sandy loam
*22 to 60 inches (56 to 152cm)—dark brown very cobbly sandy loam

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: low
Runoff: rapid
Hazard of erosion: moderate

Characteristics of Foad Soil

Position on landscape: mountainsides
Slope range: 20 to 40 percent
Slope features: steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 4 inches (5 to 10 cm)—dark yellowish brown fine sandy loam
*4 to 8 inches (10 to 20 cm)—dark brown gravelly fine sandy loam
*8 to 23 inches (20 to 58 cm)—olive brown very gravelly fine sandy loam
*23 inches (58 cm)—fractured schist over consolidated schist

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep—20 to 40 inches (51 to 102 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: moderate

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 40 percent
*soils in depressions that are poorly drained
*soils on adjacent sideslopes that have bedrock at a depth of less than 20 inches (51 cm)
*steep-walled V-notch drainages
*avalanche chutes
*rock outcroppings

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: depth to bedrock and slope
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Kupreanof Soil)

Principal tree species: western hemlock and Sitka spruce
Tree species of limited extent: paper birch
Common forest understory plants: bunchberry dogwood, one-sided wintergreen, liver-leaf

wintergreen, devil's club, trifoliate foam flower, five-leaf bramble, oakfern, early blueberry, rattlesnake plantain, highbush cranberry, spinulose shield-fern, and twisted-stalk

Habitat types (Viereck and Dyrness 1982): Sitka spruce/early blueberry-highbush cranberry/moss, Sitka-spruce/Sitka alder-highbush cranberry, western hemlock/devil's club-rusty menziesia, and western hemlock-early blueberry-rusty menziesia

Mean site index (100-year site curve) for stated species (and source): western hemlock—93 (*Barnes 1962*); Sitka spruce-92 (*Meyer 1937*) and 94 (*Taylor 1934*)

Estimated highest average production for stated species (and source): western hemlock—112 cubic feet/acre/year/at age 87 (*Barnes 1962*); Sitka spruce—93 cubic feet/acre/year at age 70 (*Meyer 1937*) and 96 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:

*The main physical limitations to harvesting are steep slopes and wet soil in spring.

*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.

*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.

*Surface erosion from unprotected, bared areas can be expected to a moderate degree.

*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:

*Use conventional wheeled and tracked equipment for harvesting.

*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.

*Overlay roads with gravel to support repeated, long-term use.

*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil compaction, displacement, and erosion.

Silvicultural considerations:

*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.

*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:

*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.

*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Forestry (Foad Soil)

Principal tree species: western hemlock and Sitka spruce

Common forest understory plants: devil's club, early blueberry, bunchberry dogwood, rusty menziesia, one-sided wintergreen, highbush cranberry, red-osier dogwood, five-leaf bramble, liver-leaf wintergreen, twisted-stalk, trifoliate foam flower, prickly currant, nagoonberry, and spinulose shield-fern

Habitat types (Viereck and Dyrness 1982): western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/devil's club-rusty menziesia

Mean site index (100-year site curve) for stated species (and source): western hemlock—90 (*Barnes 1962*); Sitka spruce—90 *(Meyer 1962)* and 89 (*Taylor 1934*)

Estimated highest average production for stated species (and source): western hemlock—105 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—104 cubic feet/acre/year at age 70 (*Meyer 1937*) and 98 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:

*The main physical limitations to harvesting are steep slopes and wet soil in spring.

*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.

*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.

*Surface erosion from unprotected, bared areas can be expected to a moderate degree.

*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:

*Use conventional wheeled and tracked equipment for harvesting.

*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.

*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil compaction, puddling, displacement, and erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.
*Because rooting depth is restricted by bedrock, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

117—Kupreanof-Foad complex, 40 to 70 percent slopes

Composition

Kupreanof and similar inclusions: 45 percent
Foad and similar inclusions: 40 percent
Contrasting inclusions: 15 percent

Characteristics of Kupreanof Soil

Position on landscape: moraines and mountainsides
Slope range: 40 to 70 percent
Slope features: very steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 3 inches (0 to 8 cm)—dark gray silt loam
*3 to 8 inches (8 to 20 cm)—dark reddish brown gravelly sandy loam
*8 to 13 inches (20 to 33 cm)—dark reddish brown very gravelly coarse sandy loam
*13 to 22 inches (33 to 56 cm)—dark brown very gravelly coarse sandy loam
*22 to 60 inches (56 to 152 cm)—dark brown very cobbly sandy loam

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: low
Runoff: rapid
Hazard of erosion: severe

Characteristics of Foad Soil

Position on landscape: mountainsides
Slope range: 40 to 70 percent
Slope features: very steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 4 inches (5 to 10 cm)—dark yellowish brown fine sandy loam
*4 to 8 inches (10 to 20 cm)—dark brown gravelly fine sandy loam
*8 to 23 inches (20 to 58 cm)—olive brown very gravelly fine sandy loam
*23 inches (58 cm)—fractured schist over consolidated schist

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep—20 to 40 inches (51 to 102 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: severe

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 70 percent
*soils in depressions that are poorly drained
*soils on adjacent sideslopes that have bedrock at a depth of less than 20 inches (51 cm)
*steep-walled V-notch drainages
*avalanche chutes
*rock outcroppings

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: depth to bedrock and slope
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Kupreanof Soil)

Principal tree species: western hemlock and Sitka spruce
Tree species of limited extent: paper birch
Common forest understory plants: bunchberry dogwood, one-sided wintergreen, liver-leaf wintergreen, devil's club, trifoliate foam flower, five-leaf bramble, oakfern, early blueberry, rattlesnake plantain, highbush cranberry, spinulose shield-fern, and twisted-stalk
Habitat types (Viereck and Dyrness 1982): Sitka spruce/early blueberry-highbush cranberry/moss, Sitka-spruce/Sitka alder-highbush cranberry, western hemlock/devil's club-rusty menziesia, and western hemlock/early blueberry-rusty menziesia
Mean site index (100-year site curve) for stated species (and source): western hemlock—93 (*Barnes 1962*); Sitka spruce—92 (*Meyer 1937*) and 94 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—112 cubic feet/acre/year/at age 87 (*Barnes 1962*); Sitka spruce—93 cubic feet/acre/year/at age 70 (*Meyer 1937*) and 96 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is steep slopes.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use cable yarding systems for harvesting. Systems that fully or partially suspend logs off the ground are less damaging to the soil.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Forestry (Foad Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: devil's club, early blueberry, bunchberry dogwood, rusty menziesia, one-sided wintergreen, highbush cranberry, red-osier dogwood, five-leaf bramble, liver-leaf wintergreen, twisted-stalk, trifoliate foam flower, prickly currant, nagoonberry, and spinulose shield-fern
Habitat types (Viereck and Dyrness 1982): western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/devil's club-rusty menziesia
Mean site index (100-year site curve) for stated species (and source): western hemlock—90 (*Barnes 1962*); Sitka spruce—90 (*Meyer 1937*) and 89 (*Taylor 1934*)

Estimated highest average production for stated species (and source): western hemlock—105 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—104 cubic feet/acre/year at age 70 (*Meyer 1937*) and 98 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is steep slopes.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use cable yarding systems for harvesting. Systems that fully or partially suspend logs off the ground are less damaging to the soil.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.
*Because rooting depth is restricted by bedrock, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

118—Lithic Cryofolists-Rock outcrop-Lithic Haplocryods complex, 70 to 120 percent slopes

Composition

Lithic Cryofolists: 30 percent
Rock outcrop: 30 percent
Lithic Haplocryods: 20 percent
Included soils: 20 percent

Characteristics of Lithic Cryofolists

Position on landscape: mountainsides
Slope range: 70 to 120 percent
Slope features: extremely steep
Native vegetation: Sitka spruce, western hemlock, lodgepole pine, and paper birch

Sample profile:
*0 to 7 inches (0 to 18 cm)—very dark grayish brown decomposed organic material
*7 to 10 inches (18 to 25 cm)—very dark gray decomposed organic material
*10 inches (25 cm)—granite bedrock

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very shallow to shallow—2 to 20 inches (5 to 51 cm) over bedrock
Drainage class: well drained
Permeability: assumed to be rapid
Available water capacity: very low to very high
Root-restricting features: bedrock
Runoff: very rapid
Hazard of erosion: slight

Characteristics of Rock Outcrop

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Characteristics of Lithic Haplocryods

Position on landscape: mountainsides
Slope range: 70 to 75 percent
Slope features: extremely steep

Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce, western hemlock, lodgepole pine, and paper birch

Sample profile:
*0 to 1 inch (0 to 3 cm)—gray silt loam
*1 to 3 inches (3 to 8 cm)—dark brown silt loam
*3 inches (8 cm)—granite bedrock
Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: very shallow to shallow—2 to 20 inches (5 to 51 cm) over bedrock
Drainage class: well drained
Permeability: moderate to moderately rapid
Available water capacity: very low to moderate
Root-restricting features: bedrock
Runoff: very rapid
Hazard of erosion: severe

Included Soils

Included are soils with properties that vary widely over short distances. These include moderately deep to deep, poorly drained to well drained soils on mountainsides, footslopes, and low-lying areas bordering mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite, with an admixture of sphagnum moss, glacial till, and loess.

Major Uses

Current uses: wildlife habitat, recreation, and forestry

Major Management Factors

Soil-related factors: depth to bedrock, rock outcroppings, and slope
Elevation: 0 to 4000 feet (0 to 1219 m)
Climatic factors (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, western hemlock, lodgepole pine, and paper birch
Operability considerations:
*Tree species and production are highly variable depending on physiographic conditions.
*The main physical limitations to harvesting are rock outcrop and steep slopes.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

119—Lithic Haplocryods-Lithic Cryofolists-Rock outcrop complex, 20 to 40 percent slopes

Composition

Lithic Haplocryods: 40 percent
Lithic Cryofolists: 20 percent
Rock outcrop: 20 percent
Included soils: 20 percent

Characteristics of Lithic Haplocryods

Position on landscape: mountainsides
Slope range: 20 to 40 percent
Slope features: steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce, western hemlock, lodgepole pine, and paper birch

Sample profile:
*0 to 1 inch (0 to 3 cm)—gray silt loam
*1 to 3 inches (3 to 8 cm)—dark brown silt loam
*3 inches (8 cm)—granite bedrock

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: very shallow to shallow—2 to 20 inches (5 to 51 cm) over bedrock
Drainage class: well drained
Permeability: moderate to moderately rapid
Available water capacity: very low to moderate
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: severe

Characteristics of Lithic Cryofolists

Position on landscape: mountainsides
Slope range: 20 to 40 percent
Slope features: steep
Native vegetation: Sitka spruce, western hemlock, lodgepole pine, and paper birch

Sample profile:
*0 to 7 inches (0 to 18 cm)—very dark grayish brown decomposed organic material

*7 to 10 inches (18 to 25 cm)—very dark gray decomposed organic material
*10 inches (25 cm)—granite bedrock

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very shallow to shallow—2 to 20 inches (5 to 51 cm) over bedrock
Drainage class: well drained
Permeability: assumed to be rapid
Available water capacity: very low to very high
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: slight

Characteristics of Rock Outcrop

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Included Soils

Included are soils with properties that vary widely over short distances. These include moderately deep to deep, poorly drained to well drained soils on mountainsides, footslopes, and low-lying areas bordering mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite, with an admixture of sphagnum moss, glacial till, and loess.

Major Uses

Current uses: wildlife habitat, recreation, and forestry

Major Management Factors

Soil-related factors: depth to bedrock, rock outcroppings, and slope
Elevation: 0 to 4000 feet (0 to 1219 m)
Climatic factors (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, western hemlock, lodgepole pine, and paper birch
Operability Considerations:
*Tree species and production are highly variable depending on physiographic conditions.
*The main physical limitations to harvesting are rock outcrop and steep slopes.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

120—Lithic Haplocryods-Lithic Cryofolists-Rock outcrop complex, 40 to 70 percent slopes

Composition

Lithic Haplocryods: 30 percent
Lithic Cryofolists: 30 percent
Rock outcrop: 20 percent
Included soils: 20 percent

Characteristics of Lithic Haplocryods

Position on landscape: mountainsides
Slope range: 40 to 70 percent
Slope features: very steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce, western hemlock, lodgepole pine, and paper birch

Sample profile:
*0 to 1 inch (0 to 3 cm)—gray silt loam
*1 to 3 inches (3 to 8 cm)—dark brown silt loam
*3 inches (8 cm)—granite bedrock

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: very shallow to shallow—2 to 20 inches (5 to 51 cm) over bedrock
Drainage class: well drained
Permeability: moderate to moderately rapid
Available water capacity: very low to moderate
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: severe

Characteristics of Lithic Cryofolists

Position on landscape: mountainsides
Slope range: 40 to 70 percent
Slope features: very steep
Native vegetation: Sitka spruce, western hemlock, lodgepole pine, and paper birch

Sample profile:
*0 to 7 inches (0 to 18 cm)—very dark grayish brown decomposed organic material

*7 to 10 inches (18 to 25 cm)—very dark gray decomposed organic material
*10 inches (25 cm)—granite bedrock

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very shallow to shallow—2 to 20 inches (5 to 51 cm) over bedrock
Drainage class: well drained
Permeability: assumed to be rapid
Available water capacity: very low to very high
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: slight

Characteristics of Rock Outcrop

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Included Soils

Included are soils with properties that vary widely over short distances. These include moderately deep to deep, poorly drained to well drained soils on mountainsides, footslopes, and low-lying areas bordering mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite, with an admixture of sphagnum moss, glacial till, and loess.

Major Uses

Current uses: wildlife habitat, recreation, and forestry

Major Management Factors

Soil-related factors: depth to bedrock, rock outcroppings, and slope
Elevation: 0 to 4000 feet (0 to 1219 m)
Climatic factors (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, western hemlock, lodgepole pine, and paper birch
Operability considerations:
*Tree species and production are highly variable depending on physiographic conditions.
*The main physical limitations to harvesting are rock outcrop and steep slopes.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

121—Lutak-Kupreanof association, 0 to 20 percent slopes

Composition

Lutak and similar inclusions: 55 percent
Kupreanof and similar inclusions: 30 percent
Contrasting inclusions: 15 percent

Characteristics of Lutak Soil

Position on landscape: stream terraces
Slope range: 0 to 10 percent
Slope features: plane to convex
Organic mat on surface: 6 inches (15 cm) thick
Native vegetation: Sitka spruce

Typical profile:
*0 to 3 inches (0 to 8 cm)—grayish brown silt loam
*3 to 5 inches (8 to 13 cm)—dark brown sandy loam
*5 to 8 inches (13 to 20 cm)—dark reddish brown loamy sand
*8 to 72 inches (20 to 183 cm)—dark brown very gravelly loamy sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: low
Runoff: slow to medium
Hazard of erosion: slight

Characteristics of Kupreanof Soil

Position on landscape: moraines and mountainsides
Slope range: 2 to 20 percent
Slope features: plane to convex
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 3 inches (0 to 8 cm)—dark gray silt loam
*3 to 8 inches (8 to 20 cm)—dark reddish brown gravelly sandy loam

*8 to 13 inches (20 to 33 cm)—dark reddish brown very gravelly coarse sandy loam
*13 to 22 inches (33 to 56 cm)—dark brown very gravelly coarse sandy loam
*22 to 60 inches (56 to 152 cm)—dark brown very cobbly sandy loam

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: low
Runoff: slow to medium
Hazard of erosion: slight

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 20 percent
*soils in depressions that are poorly drained
*avalanche chutes
*very gravelly soils on adjacent floodplains
*soils on adjacent sideslopes that are moderately deep over bedrock

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Elevation: 50 to 1200 feet (15 to 366 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Lutak Soil)

Principal tree species: Sitka spruce
Tree species of limited extent: western hemlock and black cottonwood
Common forest understory plants: highbush cranberry, early blueberry, oakfern, devil's club, bunchberry dogwood, twisted-stalk, Sitka alder, and red-osier dogwood
Habitat types (Viereck and Dyrness 1982): Sitka spruce/early blueberry-highbush cranberry/moss and Sitka spruce/devil's club-rusty menziesia
Mean site index (100-year site curve) for stated species (and source): Sitka spruce—88 (*Meyer 1937*) and 90 (*Taylor 1934*)
Estimated highest average production for stated species (and source): Sitka spruce—101 cubic feet/acre/year at age 70 (*Meyer 1937*) and 99 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is snowmelt in spring.
*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil displacement.

Silvicultural considerations:
*If seed trees are present, natural regeneration of Sitka spruce and western hemlock occurs readily.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Forestry (Kupreanof Soil)

Principal tree species: western hemlock and Sitka spruce
Tree species of limited extent: paper birch
Common forest understory plants: bunchberry dogwood, one-sided wintergreen, devil's club, trifoliate foam flower, five-leaf bramble, oakfern,

early blueberry, rattlesnake plantain, highbush cranberry, spinulose shield-fern, and twisted-stalk

Habitat types (Viereck and Dyrness 1982): Sitka spruce/early blueberry-highbush cranberry/moss, Sitka-spruce/Sitka alder-highbush cranberry, western hemlock/devil's club-rusty menziesia, and western hemlock/early blueberry-rusty menziesia

Mean site index (100-year site curve) for stated species (and source): western hemlock—93 (*Barnes 1962*); Sitka spruce—92 (*Meyer 1937*) and 94 (*Taylor 1934*)

Estimated highest average production for stated species (and source): western hemlock—112 cubic feet/acre/year/at age 87 (*Barnes 1962*); Sitka spruce—93 cubic feet/acre/year at age 70 (*Meyer 1937*) and 96 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:

*The main physical limitation to harvesting is snowmelt in spring.

*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.

*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.

*Surface erosion from unprotected, bared areas can be expected to a slight degree.

*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:

*Use conventional wheeled and tracked equipment for harvesting.

*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.

*Overlay roads with gravel to support repeated, long-term use.

*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil compaction and displacement.

Silvicultural considerations:

*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.

*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:

*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.

*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

122—Nataga-Cryorthents association, 0 to 20 percent slopes

Composition

Nataga and similar inclusions: 50 percent
Cryorthents: 35 percent
Contrasting inclusions: 15 percent

Characteristics of Nataga Soil

Position on landscape: alluvial fans and toe slopes
Slope range: 0 to 20 percent
Slope features: plane to steep
Organic mat on surface: 3 inches (8 cm) thick
Native vegetation: Sitka spruce and black cottonwood

Typical profile:

*0 to 1 inch (0 to 3 cm)—very dark grayish brown gravelly sandy loam

*1 to 12 inches (3 to 30 cm)—dark grayish brown very cobbly loamy sand

*12 to 60 inches (30 to 152 cm)—dark grayish brown extremely cobbly loamy sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat excessively drained
Permeability: in the upper part—moderate; below 1 inch (3 cm)—rapid
Available water capacity: very low
Runoff: slow to medium
Hazard of erosion: slight

Characteristics of Cryorthents

Cryorthents consist of sparsely vegetated fragmental and extremely gravelly soils located on perimeters of alluvial fans and along numerous drainageways throughout the unit. These drainages are subject to frequent shifting and flooding.

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 20 percent
*small ponded areas
*soils in depressions that are poorly drained
*avalanche chutes
*rock outcroppings
*gravel pits
*rubbleland

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Elevation: 0 to 1700 feet (0 to 518 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Nataga Soil)

Principal tree species: Sitka spruce and black cottonwood
Tree species of limited extent: western hemlock and paper birch
Common forest understory plants: Sitka alder, red-osier dogwood, early blueberry, liver-leaf wintergreen, russet buffaloberry, devil's club, bristly black currant, twisted-stalk, highbush cranberry, and pyrola
Habitat types (Viereck and Dyrness 1982): Sitka spruce/moss, black cottonwood/Sitka alder-highbush cranberry, and black cottonwood/Sitka alder-russet buffaloberry/pyrola
Mean site index (100-year site curve) for stated species (and source): Sitka spruce—101 (*Meyer 1937*) and 109 (*Taylor 1934*)
Mean site index (50-year site curve) for stated species: black cottonwood—61 (*British Columbia Forest Service 1977*)
Estimated highest average production for stated species (and source): Sitka spruce—122 cubic feet/acre/year at age 70 (*Meyer 1937*); Sitka spruce—115 cubic feet/acre/year at age 70 (*Taylor 1934*); black cottonwood—35 cubic feet/acre/year at age 60 (*British Columbia Forest Service 1977*)

Operability considerations:
*The main physical limitation to harvesting is winter snowpack.
*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil compaction, puddling, and displacement.

Silvicultural considerations:
*The droughty surface layer reduces the survival of planted or naturally established seedlings.
*If seed trees are present, natural regeneration of Sitka spruce and black cottonwood occurs readily; western hemlock, periodically.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Replace mortality to fully occupy the site.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

123—Nataga-Cryorthents association, 20 to 40 percent slopes

Composition

Nataga and similar inclusions: 55 percent
Cryorthents: 30 percent
Contrasting inclusions: 15 percent

Characteristics of Nataga Soil

Position on landscape: alluvial fans and toe slopes
Slope range: 20 to 40 percent
Slope features: steep
Organic mat on surface: 3 inches (8 cm) thick
Native vegetation: Sitka spruce and black cottonwood

Typical profile:
*0 to 1 inch (0 to 3 cm)—very dark grayish brown gravelly sandy loam
*1 to 12 inches (3 to 30 cm)—dark grayish brown very cobbly loamy sand
*12 to 60 inches (30 to 152 cm)—dark grayish brown extremely cobbly loamy sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat excessively drained
Permeability: in the upper part—moderate; below 1 inch (3 cm)—rapid
Available water capacity: very low
Runoff: rapid
Hazard of erosion: slight

Characteristics of Cryorthents

Cryorthents consists of sparsely vegetated fragmental and extremely gravelly soils located on perimeters of alluvial fans and along numerous drainageways throughout the unit. These drainages are subject to frequent shifting and flooding.

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 40 percent
*steep-walled V-notch drainages
*soils in depressions that are poorly drained
*avalanche chutes
*rock outcroppings
*rubbleland

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: slope
Elevation: 0 to 1700 feet (0 to 518 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Nataga Soil)

Principal tree species: Sitka spruce and black cottonwood
Tree species of limited extent: western hemlock and paper birch
Common forest understory plants: Sitka alder, red-osier dogwood, early blueberry, liver-leaf wintergreen, russet buffaloberry, devil's club, bristly black currant, twisted-stalk, highbush cranberry, and pyrola
Habitat types (Viereck and Dyrness 1982): Sitka spruce/moss, black cottonwood/Sitka alder-highbush cranberry, and black cottonwood/Sitka alder-russet buffaloberry/pyrola
Mean site index (100-year site curve) for stated species (and source): Sitka spruce—101 (*Meyer 1937*) and 109 (*Taylor 1934*)
Mean site index (50-year site curve) for stated species: black cottonwood—61 (*British Columbia Forest Service 1977*)
Estimated highest average production for stated species (and source): Sitka spruce—122 cubic feet/acre/year at age 70 (*Meyer 1937*); Sitka spruce—115 cubic feet/acre/year at age 70 (*Taylor 1934*); black cottonwood—35 cubic feet/acre/year at age 60 (*British Columbia Forest Service 1977*)

Operability considerations:
*The main physical limitations to harvesting are steep slopes and winter snowpack.
*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil compaction, puddling, displacement, and erosion.

Silvicultural considerations:
*The droughty surface layer reduces the survival of planted or naturally established seedlings.
*If seed trees are present, natural regeneration of Sitka spruce and black cottonwood occurs readily; western hemlock, periodically.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Replace mortality to fully occupy the site.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

124—Riverwash

Position on landscape: floodplains

This map unit consists of frequently flooded, unsorted silts, sands, gravels, and cobbles. The configuration and location of these sediments in the floodplains is affected by flooding and can be expected to change. This map unit is usually barren, but some areas may have sparse growth of willows, alders, or fireweed. Slope ranges from 0 to 3 percent.

125—Rock outcrop-Lithic Cryofolists complex, 20 to 40 percent slopes

Composition

Rock outcrop: 50 percent
Lithic Cryofolists: 30 percent
Included soils: 20 percent

Characteristics of Rock Outcrop

Rock outcrop consists of areas of metamorphic rock and granite.

Characteristics of Lithic Cryofolists

Position on landscape: mountainsides
Slope range: 20 to 40 percent
Slope features: steep
Native vegetation: Sitka spruce, western hemlock, lodgepole pine, and paper birch

Sample profile:
*0 to 7 inches (0 to 18 cm)—very dark grayish brown decomposed organic material
*7 to 10 inches (18 to 25 cm)—very dark gray decomposed organic material
*10 inches (25 cm)—granite bedrock

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very shallow to shallow—0 to 20 inches (0 to 51 cm) over bedrock
Drainage class: well drained
Permeability: assumed to be rapid
Available water capacity: very low to very high
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: slight

Included Soils

Included are soils with properties that vary widely over short distances. These include very shallow to deep, poorly drained to well drained organic and mineral soils on mountainsides, footslopes, and low-lying areas bordering mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite, with an admixture of sphagnum moss, glacial till, and loess.

Major Uses

Current uses: wildlife habitat, recreation, and forestry

Major Management Factors

Soil-related factors: depth to bedrock, rock outcroppings, and slope
Elevation: 0 to 4000 feet (0 to 1219 m)
Climatic factors (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, paper birch, western hemlock, and lodgepole pine

Operability considerations:
*Tree species and production are highly variable depending on physiographic conditions.
*The main physical limitations to harvesting are rock outcrop and steep slopes.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

126—Rock outcrop-Lithic Cryofolists complex, 40 to 70 percent slopes

Composition

Rock outcrop: 55 percent
Lithic Cryofolists: 25 percent
Included soils: 20 percent

Characteristics of Rock Outcrop

Rock outcrop consists of areas of metamorphic rock and granite.

Characteristics of Lithic Cryofolists

Position on landscape: mountainsides
Slope range: 40 to 70 percent
Slope features: very steep
Native vegetation: Sitka spruce, western hemlock, lodgepole pine, and paper birch

Sample profile:
*0 to 7 inches (0 to 18 cm)—very dark grayish brown decomposed organic material
*7 to 10 inches (18 to 25 cm)—very dark gray decomposed organic material
*10 inches (25 cm)—granite bedrock

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very shallow to shallow—0 to 20 inches (0 to 51 cm) over bedrock
Drainage class: well drained
Permeability: assumed to be rapid
Available water capacity: very low to very high
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: slight

Included Soils

Included are soils with properties that vary widely over short distances. These include very shallow to deep, poorly drained to well drained mineral and organic soils on mountainsides, footslopes, and low-lying areas bordering mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite, with an admixture of sphagnum moss, glacial till, and loess.

Major Uses

Current uses: wildlife habitat, recreation, and forestry

Major Management Factors

Soil-related factors: depth to bedrock, rock outcroppings, and slope
Elevation: 0 to 4000 feet (0 to 1219 m)
Climatic factors (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, paper birch, western hemlock, and lodgepole pine

Operability considerations:
*Tree species and production are highly variable depending on physiographic conditions.
*The main physical limitations to harvesting are rock outcrop and steep slopes.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

127—Rock outcrop-Lithic Cryofolists complex, 70 to 120 percent slopes

Composition

Rock outcrop: 60 percent
Lithic Cryofolists: 20 percent
Included soils: 20 percent

Characteristics of Rock Outcrop

Rock outcrop consists of areas of metamorphic rock and granite.

Characteristics of Lithic Cryofolists

Position on landscape: mountainsides
Slope range: 70 to 120 percent
Slope features: extremely steep
Native vegetation: Sitka spruce, western hemlock, lodgepole pine, and paper birch

Sample profile:
*0 to 7 inches (0 to 18 cm)—very dark grayish brown decomposed organic material
*7 to 10 inches (18 to 25 cm)—very dark gray decomposed organic material
*10 inches (25 cm)—granite bedrock

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very shallow to shallow—0 to 20 inches (0 to 51 cm) over bedrock
Drainage class: well drained
Permeability: assumed to be rapid
Available water capacity: very low to very high
Root-restricting features: bedrock
Runoff: very rapid
Hazard of erosion: slight

Included Soils

Included are soils with properties that vary widely over short distances. These include very shallow to deep, poorly drained to well drained mineral and organic soils on mountainsides, footslopes, and low-lying areas bordering mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite, with an admixture of sphagnum moss, glacial till, and loess.

Major Uses

Current uses: wildlife habitat, recreation, and forestry

Major Management Factors

Soil-related factors: depth to bedrock, rock outcroppings, and slope
Elevation: 0 to 4000 feet (0 to 1219 m)
Climatic factors (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, paper birch, western hemlock, and lodgepole pine

Operability considerations:
*Tree species and production are highly variable depending on physiographic conditions.
*The main physical limitations to harvesting are rock outcrop and steep slopes.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

128—Rock outcrop-Lithic Cryorthents complex, 70 to 120 percent slopes

Composition

Rock outcrop: 60 percent
Lithic Cryorthents: 25 percent
Included soils: 15 percent

Characteristics of Rock Outcrop

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Characteristics of Lithic Cryorthents

Position on landscape: mountainsides
Slope range: 70 to 120 percent
Slope features: extremely steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce, western hemlock, lodgepole pine, and paper birch

Sample profile:
*0 to 2 inches (0 to 5 cm)—very dark grayish brown silt loam
*2 to 6 inches (5 to 15 cm)—yellowish brown silt loam
*6 inches (15 cm)—metamorphic bedrock

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: very shallow to shallow—2 to 20 inches (5 to 51 cm) over bedrock
Drainage class: well drained
Permeability: moderately rapid to rapid
Available water capacity: very low to low
Root-restricting features: bedrock
Runoff: very rapid
Hazard of erosion: severe

Included Soils

Included are soils with properties that vary widely over short distances. These include very shallow to deep, poorly drained to well drained soils on mountainsides, footslopes, and low-lying areas bordering mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite, with an admixture of sphagnum moss, glacial till, and loess.

Major Uses

Current uses: wildlife habitat, recreation, and forestry

Major Management Factors

Soil-related factors: depth to bedrock, rock outcroppings, and slope
Elevation: 0 to 4000 feet (0 to 1219 m)
Climatic factors (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, western hemlock, lodgepole pine, and paper birch

Operability considerations:
*Tree species and production are highly variable depending on physiographic conditions.
*The main physical limitations to harvesting are rock outcrop and steep slopes.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

129—Rock outcrop-Tolstoi complex, 70 to 100 percent slopes

Composition

Rock outcrop: 55 percent
Tolstoi and similar inclusions: 30 percent
Contrasting inclusions: 15 percent

Characteristics of Rock Outcrop

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Characteristics of Tolstoi Soil

Position on landscape: mountainsides
Slope range: 70 to 100 percent
Slope features: extremely steep
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 3 inches (0 to 8 cm)—dark brown silt loam
*3 to 5 inches (8 to 13 cm)—dark brown very cobbly silt loam
*5 to 15 inches (13 to 38 cm)—reddish brown extremely cobbly silt loam
*15 inches (38 cm)—schist bedrock

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: shallow—14 to 20 inches (36 to 51 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 3 inches (8 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: very rapid
Hazard of erosion: severe

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 100 percent
*soils in depressions that are poorly drained
*steep-walled V-notch drainages
*avalanche chutes

Major uses

Current uses: forestry, wildlife habitat, and recreation

Major management factors

Soil-related factors: depth to bedrock, slope, and rock outcroppings
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Tolstoi Soil)

Principal tree species: western hemlock and Sitka spruce

Common forest understory plants: rusty menziesia, devil's club, bunchberry dogwood, oakfern, early blueberry, five-leaf bramble, twisted-stalk, liver-leaf wintergreen, bristly black currant, trifoliate foam flower, red baneberry, western hemlock, and highbush cranberry
Habitat types (Viereck and Dyrness 1982): Sitka spruce-western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/early blueberry-highbush cranberry/moss
Mean site index (100-year site curve) for stated species (and source): western hemlock—87 (*Barnes 1962*); Sitka spruce—99 (*Meyer 1937*) and 101 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—100 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—117 cubic feet/acre/year at age 70 (*Meyer 1937*) and 117 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is steep slopes.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use cable yarding systems for harvesting. Systems that fully or partially suspend logs off the ground are less damaging to the soil.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of Sitka spruce and western hemlock occurs periodically.
*Because rooting depth is restricted by depth to bedrock, trees are frequently subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

130—Rock outcrop-Tolstoi-Foad complex, 70 to 100 percent slopes

Composition

Rock outcrop: 40 percent
Tolstoi and similar inclusions: 25 percent
Foad and similar inclusions: 25 percent
Contrasting inclusions: 10 percent

Characteristics of Rock Outcrop

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Characteristics of Tolstoi Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Tolstoi is on the erosional areas.
Slope range: 70 to 100 percent
Slope features: extremely steep
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka alder

Typical profile:
*0 to 3 inches (0 to 8 cm)—dark brown silt loam
*3 to 5 inches (8 to 13 cm)—dark brown very cobbly silt loam
*5 to 15 inches (13 to 38 cm)—reddish brown extremely cobbly silt loam
*15 inches (38 cm)—schist bedrock

Micro-wasting has resulted in mixing and churning of horizons in many profiles.

Depth class: shallow—14 to 20 inches (36 to 51 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 3 inches (8 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: very rapid
Hazard of erosion: severe

Characteristics of Foad Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Foad is in the depositional areas.
Slope range: 70 to 100 percent
Slope features: extremely steep
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka alder

Typical profile:
*0 to 3 inches (0 to 8 cm)—very dark grayish brown silt loam
*3 to 5 inches (8 to 13 cm)—dark reddish brown very cobbly silt loam
*5 to 30 inches (13 to 76 cm)—reddish brown extremely cobbly silt loam
*30 inches (76 cm)—fractured schist over consolidated schist

Micro-wasting has resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep—20 to 40 inches (51 to 102 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 3 inches (8 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: very rapid
Hazard of erosion: severe

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 100 percent
*soils in depressions that are poorly drained
*steep-walled V-notch drainages
*avalanche chutes
*rock outcroppings

Major Uses

Current uses: recreation and wildlife habitat

Major Management Factors

Soil-related factors: slope, depth to bedrock, and rock outcroppings
Elevation: 2500 to 3000 feet (762 to 914 m)
Climatic factors (average annual):
*precipitation—60 to 120 inches (152 to 305 cm)
*air temperature—35 to 37 °F (2 to 3 °C)
*growing degree days—less than 500

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

131—Rock outcrop and Glaciers

Position on landscape: mountaintops

This map unit consists of extensive areas of bare rock and icefields. The unit is primarily restricted to the highest elevations and extends across mountain crests, ridges, and steep walled shoulder slopes. The unit also extends down valleys containing active glaciers. Slopes range from 5 to 180 percent.

132—Rubbleland

Position on landscape: mountainsides

This map unit consists of unvegetated areas of loose rock fragments ranging in size from channers to boulders. The unit includes talus slopes and active avalanche chutes on mountain sideslopes. Slopes range from 20 to 180 percent.

133—Skagway-Funter association, 0 to 5 percent slopes

Composition

Skagway and similar inclusions: 45 percent
Funter and similar inclusions: 40 percent
Contrasting inclusions: 15 percent

Characteristics of Skagway Soil

Position on landscape: floodplains and outwash plains
Slope range: 0 to 5 percent
Slope features: plane

Organic mat on surface: 4 inches (10 cm) thick
Native vegetation: black cottonwood

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark brown fine sandy loam
*2 to 17 inches (5 to 43 cm)—dark grayish brown and yellowish brown loamy fine sand
*17 to 60 inches (43 to 152 cm)—dark grayish brown loamy fine sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat poorly drained
Permeability: in the upper part—moderate; below 2 inches (5 cm)—rapid
Available water capacity: very low
Root-restricting features: water table
Runoff: slow
Hazard of erosion: slight
Depth to water table: in May through August—18 to 30 inches (46 to 76 cm); rest of year—below 40 inches (102 cm)
Hazard of flooding: frequent—April to September

Characteristics of Funter Soil

Position on landscape: floodplains
Microtopography: muskegs
Slope range: 0 to 5 percent
Slope features: concave
Native vegetation: sphagnum moss

Typical profile:
*0 to 12 inches (0 to 30 cm)—light olive brown sphagnum peat
*12 to 24 inches (30 to 61 cm)—light yellowish brown peat
*24 to 42 inches (61 to 107 cm)—dark brown peat
*42 to 60 inches (107 to 152 cm)—grayish brown silt

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly drained
Permeability: in the upper part—assumed to be rapid; below 42 inches (107 cm)—moderate
Available water capacity: very high
Root-restricting features: water table
Runoff: very slow
Hazard of erosion: slight
Depth to water table: 0 to 12 inches (0 to 30 cm)
Hazard of flooding: frequent—April to September

Included Areas

Contrasting inclusions:
*very gravelly soils on adjacent floodplains
*gravel bars and riverwash
*ponded areas
*gravel pits

Major uses

Current uses: wildlife habitat, forestry, and recreation

Major Management Factors

Soil-related factors: flooding and depth to water table
Elevation: 0 to 1000 feet (0 to 305 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Skagway Soil)

Principal tree species: black cottonwood
Common forest understory plants: Sitka alder, highbush cranberry, red-osier dogwood, horsetail, liver-leaf wintergreen, calamagrostis, sweet-scented bedstraw, and red baneberry
Habitat type (Viereck and Dyrness 1982): black cottonwood/Sitka alder-highbush cranberry
Mean site index (50-year site curve) for stated species: black cottonwood—80 (*British Columbia Forest Service 1977*)
Estimated highest average production for stated species (and source): black cottonwood—35 cubic feet/acre/year at age 60 (*British Columbia Forest Service 1977*)

Operability considerations:
*The main physical limitations to harvesting are frequent flooding and a seasonal high water table.
*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.

*Install culverts or other drainage structures to improve road utility and reduce the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil displacement.

Silvicultural considerations:
*Frequent flooding and a seasonal high water table reduce the survival of planted or naturally established seedlings.
*If seed trees are present, natural regeneration of black cottonwood occurs readily.
*Because rooting depth is restricted by the periodic high water table, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can prevent the establishment of seedlings.

Suitable management practices:
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.

Forestry (Funter Soil)

This soil does not support forestland vegetation.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, beaver, bald eagles, and a variety of other birds and mammals.

134—Tolstoi-Foad complex, 5 to 20 percent slopes

Composition

Tolstoi and similar inclusions: 45 percent
Foad and similar inclusions: 40 percent
Contrasting inclusions: 15 percent

Characteristics of Tolstoi Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Tolstoi is on the erosional areas.
Slope range: 10 to 20 percent
Slope features: plane
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 6 inches (5 to 15 cm)—dark brown gravelly silt loam
*6 to 11 inches (15 to 28 cm)—dark brown very gravelly silt loam
*11 to 19 inches (28 to 48 cm)—dark brown very cobbly silt loam
*19 inches (48 cm)—schist bedrock

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: shallow—14 to 20 inches (36 to 51 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 6 inches (15 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: medium
Hazard of erosion: slight

Characteristics of Foad Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Foad is in the depositional areas.
Slope range: 5 to 20 percent
Slope features: concave
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 4 inches (5 to 10 cm)—dark yellowish brown fine sandy loam
*4 to 8 inches (10 to 20 cm)—dark brown gravelly fine sandy loam
*8 to 23 inches (20 to 58 cm)—olive brown very gravelly fine sandy loam
*23 inches (58 cm)—fractured schist over consolidated schist

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep—20 to 40 inches (51 to 102 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: very low

Root-restricting features: bedrock
Runoff: medium
Hazard of erosion: slight

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 20 percent
*soils in depressions that are poorly drained
*soils on adjacent sideslopes that have bedrock at a depth of less than 14 inches (36 cm)
*steep-walled V-notch drainages
*avalanche chutes
*rock outcroppings

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: depth to bedrock and slope
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Tolstoi Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: rusty menziesia, devil's club, bunchberry dogwood, oakfern, early blueberry, five-leaf bramble, twisted-stalk, liver-leaf wintergreen, bristly black currant, trifoliate foam flower, red baneberry, western hemlock, and highbush cranberry
Habitat types (Viereck and Dyrness 1982): Sitka spruce-western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/early blueberry-highbush cranberry/moss
Mean site index (100-year site curve) for stated species (and source): western hemlock—87 (*Barnes 1962*); Sitka spruce—99 (*Meyer 1937*) and 101 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—100 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—117 cubic feet/acre/year at age 70 (*Meyer 1937*) and 117 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is snowmelt in spring.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of puddling and soil compaction.

Silvicultural considerations:
*If seed trees are present, natural regeneration of Sitka spruce and western hemlock occurs periodically.
*Because rooting depth is restricted by bedrock, trees are frequently subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Forestry (Foad Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: devil's club, early blueberry, bunchberry dogwood, rusty menziesia, one-sided wintergreen, highbush cranberry, red-osier dogwood, five-leaf bramble, liver-leaf wintergreen, twisted-stalk, trifoliate foam flower, prickly currant, nagoonberry, and spinulose shield-fern
Habitat types (Viereck and Dyrness 1982): western hemlock/devil's club-rusty menziesia and Sitka

spruce western hemlock/devil's club-rusty menziesia
Mean site index (100-year site curve) for stated species (and source): western hemlock—90 (*Barnes 1962*); Sitka spruce—90 (*Barnes 1962*), 90 (*Meyer 1937*) and 89 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—105 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—104 cubic feet/acre/year at age 70 (*Meyer 1937*) and 98 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is snowmelt in spring.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of compaction, puddling, and displacement.
Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.
*Because rooting depth is restricted by bedrock, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

135—Tolstoi-Foad complex, 20 to 40 percent slopes

Composition

Tolstoi and similar inclusions: 55 percent
Foad and similar inclusions: 30 percent
Contrasting inclusions: 15 percent

Characteristics of Tolstoi Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Tolstoi is on the erosional areas.
Slope range: 20 to 40 percent
Slope features: steep
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 6 inches (5 to 15 cm)—dark brown gravelly silt loam
*6 to 11 inches (15 to 28 cm)—dark brown very gravelly silt loam
*11 to 19 inches (28 to 48 cm)—dark brown very cobbly silt loam
*19 inches (48 cm)—schist bedrock

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: shallow—14 to 20 inches (36 to 51 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 6 inches (15 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: severe

Characteristics of Foad Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Foad is in the depositional areas.
Slope range: 20 to 40 percent
Slope features: steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 4 inches (5 to 10 cm)—dark yellowish brown fine sandy loam
*4 to 8 inches (10 to 20 cm)—dark brown gravelly fine sandy loam
*8 to 23 inches (20 to 58 cm)—olive brown very gravelly fine sandy loam
*23 inches (58 cm)—fractured schist over consolidated schist

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep—20 to 40 inches (51 to 102 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: moderate

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 40 percent
*soils in depressions that are poorly drained
*soils on adjacent sideslopes that have bedrock at a depth of less than 14 inches (36 cm)
*steep-walled V-notch drainages
*avalanche chutes
*rock outcroppings

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: depth to bedrock and slope
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Tolstoi Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: rusty menziesia, devil's club, bunchberry dogwood, oakfern, early blueberry, five-leaf bramble, twisted-stalk, liver-leaf wintergreen, bristly black currant, trifoliate foam flower, red baneberry, western hemlock, and highbush cranberry.
Habitat types (Viereck and Dyrness 1982): Sitka spruce-western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/early blueberry-highbush cranberry/moss
Mean site index (100-year site curve) for stated species (and source): western hemlock—87 (*Barnes 1962*); Sitka spruce—99 (*Meyer 1937*) and 101 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—100 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—117 cubic feet/acre/year at age 70 (*Meyer 1937*) and 117 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitations to harvesting are steep slopes and wet soil in spring.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of puddling, soil compaction, and surface erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of

Sitka spruce and western hemlock occurs periodically.
*Because rooting depth is restricted by depth to bedrock, trees are frequently subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Forestry (Foad Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: devil's club, early blueberry, bunchberry dogwood, rusty menziesia, one-sided wintergreen, highbush cranberry, red-osier dogwood, five-leaf bramble, liver-leaf wintergreen, twisted-stalk, trifoliate foam flower, prickly currant, nagoonberry, and spinulose shield-fern
Habitat types (Viereck and Dyrness 1982): western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/devil's club-rusty menziesia
Mean site index (100-year site curve) for stated species (and source): western hemlock—90 (*Barnes 1962*); Sitka spruce—90 (*Meyer 1937*) and 89 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—105 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—104 cubic feet/acre/year at age 70 (*Meyer 1937*) and 98 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitations to harvesting are steep slopes and wet soils in spring.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a moderate degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil compaction, puddling, displacement, and erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.
*Because rooting depth is restricted by bedrock, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

136—Tolstoi-Foad complex, 40 to 70 percent slopes

Composition

Tolstoi and similar inclusions: 60 percent

Foad and similar inclusions: 25 percent
Contrasting inclusions: 15 percent

Characteristics of Tolstoi Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Tolstoi is on the erosional areas.
Slope range: 40 to 70 percent
Slope features: very steep
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 6 inches (5 to 15 cm)—dark brown gravelly silt loam
*6 to 11 inches (15 to 28 cm)—dark brown very gravelly silt loam
*11 to 19 inches (28 to 48 cm)—dark brown very cobbly silt loam
*19 inches (48 cm)—schist bedrock

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: shallow—14 to 20 inches (36 to 51 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 6 inches (15 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: severe

Characteristics of Foad Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Foad is in the depositional areas.
Slope range: 40 to 70 percent
Slope features: very steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 4 inches (5 to 10 cm)—dark yellowish brown fine sandy loam
*4 to 8 inches (10 to 20 cm)—dark brown gravelly fine sandy loam
*8 to 23 inches (20 to 58 cm)—olive brown very gravelly fine sandy loam
*23 inches (58 cm)—fractured schist over consolidated schist

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep—20 to 40 inches (51 to 102 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: severe

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 70 percent
*soils in depressions that are poorly drained
*soils on adjacent sideslopes that have bedrock at a depth of less than 14 inches (36 cm)
*steep-walled V-notch drainages
*avalanche chutes
*rock outcroppings

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: depth to bedrock and slope
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Tolstoi Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: rusty menziesia, devil's club, bunchberry dogwood, oakfern, early blueberry, five-leaf bramble, twisted-stalk, liver-leaf wintergreen, bristly black currant, trifoliate foam flower, red baneberry, western hemlock, and highbush cranberry
Habitat types (Viereck and Dyrness 1982): Sitka spruce-western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/early blueberry-highbush cranberry/moss
Mean site index (100-year site curve) for stated species (and source): western hemlock—87 (*Barnes 1962*); Sitka spruce—99 (*Meyer 1937*) and 101 (*Taylor 1934*)

Estimated highest average production for stated species (and source): western hemlock—100 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—117 cubic feet/acre/year at age 70 (*Meyer 1937*) and 117 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is steep slopes.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use cable yarding systems for harvesting. Systems that fully or partially suspend logs off the ground are less damaging to the soil.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of Sitka spruce and western hemlock occurs periodically.
*Because rooting depth is restricted by depth to bedrock, trees are frequently subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Forestry (Foad Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: devil's club, early blueberry, bunchberry dogwood, rusty menziesia, one-sided wintergreen, highbush cranberry, red-osier dogwood, five-leaf bramble, liver-leaf wintergreen, twisted-stalk, trifoliate foam flower, prickly currant, nagoonberry, and spinulose shield-fern
Habitat types (Viereck and Dyrness 1982): western hemlock/devil's club-rusty menziesia, and Sitka spruce-western hemlock/devil's club-rusty menziesia
Mean site index (100-year site curve) for stated species (and source): western hemlock—90 (*Barnes 1962*); Sitka spruce—90 (*Meyer 1937*) and 89 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—105 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—104 cubic feet/acre/year at age 70 (*Meyer 1937*) and 98 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is steep slopes.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use cable yarding systems for harvesting. Systems that fully or partially suspend logs off the ground are less damaging to the soil.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.

*Because rooting depth is restricted by bedrock, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

137—Tolstoi-Rock outcrop complex, 10 to 20 percent slopes

Composition

Tolstoi and similar inclusions: 55 percent
Rock outcrop: 30 percent
Contrasting inclusions: 15 percent

Characteristics of Tolstoi Soil

Position on landscape: mountainsides
Slope range: 10 to 20 percent
Slope features: plane to moderately steep
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 6 inches (5 to 15 cm)—dark brown gravelly silt loam
*6 to 11 inches (15 to 28 cm)—dark brown very gravelly silt loam
*11 to 19 inches (28 to 48 cm)—dark brown very cobbly silt loam
*19 inches (48 cm)—schist bedrock

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: shallow—14 to 20 inches (36 to 51 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 6 inches (15 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: medium
Hazard of erosion: slight

Characteristics of Rock Outcrop

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 20 percent
*soils in depressions that are poorly drained
*steep-walled V-notch drainages
*avalanche chutes

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: depth to bedrock and rock outcroppings
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Tolstoi Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: rusty menziesia, devil's club, bunchberry dogwood, oakfern, early blueberry, five-leaf bramble, twisted-stalk, liver-leaf wintergreen, bristly black currant, trifoliate foam flower, red baneberry, western hemlock, and highbush cranberry
Habitat types (Viereck and Dyrness 1982): Sitka spruce-western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/early blueberry-highbush cranberry/moss
Mean site index (100-year site curve) for stated species (and source): western hemlock—87 (*Barnes 1962*); Sitka spruce—99 (*Meyer 1937*) and 101 (*Taylor 1934*)

Estimated highest average production for stated species (and source): western hemlock—100 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—117 cubic feet/acre/year at age 70 (*Meyer 1937*) and 117 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is snowmelt in spring.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of puddling and soil compaction.

Silvicultural considerations:
*If seed trees are present, natural regeneration of Sitka spruce and western hemlock occurs periodically.
*Because rooting depth is restricted by bedrock, trees are frequently subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

138—Tolstoi-Rock outcrop complex, 20 to 40 percent slopes

Composition

Tolstoi and similar inclusions: 50 percent
Rock outcrop: 35 percent
Contrasting inclusions: 15 percent

Characteristics of Tolstoi Soil

Position on landscape: mountainsides
Slope range: 20 to 40 percent
Slope features: steep
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 6 inches (5 to 15 cm)—dark brown gravelly silt loam
*6 to 11 inches (15 to 28 cm)—dark brown very gravelly silt loam
*11 to 19 inches (28 to 48 cm)—dark brown very cobbly silt loam
*19 inches (48 cm)—schist bedrock

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: shallow—14 to 20 inches (36 to 51 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 6 inches (15 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: severe

Characteristics of Rock Outcrop

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 40 percent
*soils in depressions that are poorly drained
*steep-walled V-notch drainages
*avalanche chutes

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: depth to bedrock, slope, and rock outcroppings
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Tolstoi Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: rusty menziesia, devil's club, bunchberry dogwood, oakfern, early blueberry, five-leaf bramble, twisted-stalk, liver-leaf wintergreen, bristly black currant, trifoliate foam flower, red baneberry, western hemlock, and highbush cranberry
Habitat types (Viereck and Dyrness 1982): Sitka spruce-western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/early blueberry-highbush cranberry/moss
Mean site index (100-year site curve) for stated species (and source): western hemlock—87 (*Barnes 1962*); Sitka spruce—99 (*Meyer 1937*) and 101 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—100 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—117 cubic feet/acre/year at age 70 (*Meyer 1937*) and 117 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitations to harvesting are steep slopes and wet soil in spring.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of puddling, soil compaction, and surface erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of Sitka spruce and western hemlock occurs periodically.
*Because rooting depth is restricted by depth to bedrock, trees are frequently subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

139—Tolstoi-Rock outcrop complex, 40 to 70 percent slopes

Composition

Tolstoi and similar inclusions: 45 percent
Rock outcrop: 40 percent
Contrasting inclusions: 15 percent

Characteristics of Tolstoi Soil

Position on landscape: mountainsides
Slope range: 40 to 70 percent
Slope features: very steep
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 6 inches (5 to 15 cm)—dark brown gravelly silt loam
*6 to 11 inches (15 to 28 cm)—dark brown very gravelly silt loam
*11 to 19 inches (28 to 48 cm)—dark brown very cobbly silt loam
*19 inches (48 cm)—schist bedrock

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: shallow—14 to 20 inches (36 to 51 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 6 inches (15 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: severe

Characteristics of Rock Outcrop

Rock outcrop consists of areas of exposed metamorphic rock and granite.

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 70 percent
*soils in depressions that are poorly drained
*steep-walled V-notch drainages
*avalanche chutes

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: depth to bedrock, slope, and rock outcroppings
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Tolstoi Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: rusty menziesia, devil's club, bunchberry dogwood, oakfern, early blueberry, five-leaf bramble, twisted-stalk, liver-leaf wintergreen, bristly black currant, trifoliate foam flower, red baneberry, western hemlock, and highbush cranberry
Habitat types (Viereck and Dyrness 1982): Sitka spruce-western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/early blueberry-highbush cranberry/moss
Mean site index (100-year site curve) for stated species (and source): western hemlock—87 (*Barnes 1962*); Sitka spruce—99 (*Meyer 1937*) and 101 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—100 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—117 cubic feet/acre/year at age 70 (*Meyer 1937*) and 117 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is steep slopes.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use cable yarding systems for harvesting. Systems that fully or partially suspend logs off the ground are less damaging to the soil.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of Sitka spruce and western hemlock occurs periodically.
*Because rooting depth is restricted by depth to bedrock, trees are frequently subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western

hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

140—Tolstoi-Foad complex, 70 to 100 percent slopes

Composition

Tolstoi and similar inclusions: 65 percent
Foad and similar inclusions: 20 percent
Contrasting inclusions: 15 percent

Characteristics of Tolstoi Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Tolstoi is on the erosional areas.
Slope range: 70 to 100 percent
Slope features: extremely steep
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 3 inches (0 to 8 cm)—dark brown silt loam
*3 to 5 inches (8 to 13 cm)—dark brown very cobbly silt loam
*5 to 15 inches (13 to 38 cm)—reddish brown extremely cobbly silt loam
*15 inches (38 cm)—schist bedrock

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: shallow—14 to 20 inches (36 to 51 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 3 inches (8 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: very rapid
Hazard of erosion: severe

Characteristics of Foad Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Foad is in the depositional areas.
Slope range: 70 to 100 percent
Slope features: extremely steep
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka spruce and western hemlock

Typical profile:
*0 to 3 inches (0 to 8 cm)—very dark grayish brown silt loam
*3 to 5 inches (8 to 13 cm)—dark reddish brown very cobbly silt loam
*5 to 30 inches (13 to 76 cm)—reddish brown extremely cobbly silt loam
*30 inches (76 cm)—fractured schist over consolidated schist

Windthrow and micro-wasting have resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep—20 to 40 inches (51 to 102 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 3 inches (8 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: very rapid
Hazard of erosion: severe

Included Areas

Contrasting inclusions:
*soils that have slopes of more than 100 percent
*soils in depressions that are poorly drained
*soils on adjacent sideslopes that have bedrock at a depth of less than 14 inches (36 cm)
*steep-walled V-notch drainages
*avalanche chutes
*rock outcroppings

Major Uses

Current uses: forestry, wildlife habitat, and recreation

Major Management Factors

Soil-related factors: depth to bedrock and slope
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Tolstoi Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: rusty menziesia, devil's club, bunchberry dogwood, oakfern, early blueberry, five-leaf bramble, twisted-stalk, liver-leaf wintergreen, bristly black currant, trifoliate foam flower, red baneberry, western hemlock, and highbush cranberry
Habitat types (Viereck and Dyrness 1982): Sitka spruce-western hemlock/devil's club-rusty menziesia and Sitka spruce-western hemlock/early blueberry-highbush cranberry/moss
Mean site index (100-year site curve) for stated species (and source): western hemlock—87 (*Barnes 1962*); Sitka spruce—99 (*Meyer 1937*) and 101 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—100 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—117 cubic feet/acre/year at age 70 (*Meyer 1937*) and 117 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is steep slopes.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use cable yarding systems for harvesting. Systems that fully or partially suspend logs off the ground are less damaging to the soil.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of Sitka spruce and western hemlock occurs periodically.
*Because rooting depth is restricted by depth to bedrock, trees are frequently subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Forestry (Foad Soil)

Principal tree species: western hemlock and Sitka spruce
Common forest understory plants: devil's club, early blueberry, bunchberry dogwood, rusty menziesia, one-sided wintergreen, highbush cranberry, red-osier dogwood, five-leaf bramble, liver-leaf wintergreen, twisted-stalk, trifoliate foam flower, prickly currant, nagoonberry, and spinulose shield-fern
Habitat types (Viereck and Dyrness 1982): western hemlock/devil's club-rusty menziesia, and Sitka spruce-western hemlock/devil's club-rusty menziesia
Mean site index (100-year site curve) for stated species (and source): western hemlock—90 (*Barnes 1962*); Sitka spruce—90 (*Meyer 1937*) and 89 (*Taylor 1934*)
Estimated highest average production for stated species (and source): western hemlock—105 cubic feet/acre/year at age 60 (*Barnes 1962*); Sitka spruce—104 cubic feet/acre/year at age 70 (*Meyer 1937*) and 98 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitation to harvesting is steep slopes.
*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a severe degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use cable yarding systems for harvesting. Systems that fully or partially suspend logs off the ground are less damaging to the soil.
*Install water bars, culverts, or other drainage structures to reduce erosion and decrease the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Establish plant cover on disturbed road cut and fill slopes, landings, skid trails, and firebreaks to reduce the risk of erosion.

Silvicultural considerations:
*If seed trees are present, natural regeneration of western hemlock and Sitka spruce occurs readily.
*Because rooting depth is restricted by bedrock, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can delay the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce and western hemlock seedlings from adapted parent stock.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.
*Maintain high growth rates, provide periodic income, and develop more windfirm trees through precommercial and subsequent thinning of established stands of saplings.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

141—Tolstoi, Foad, and Kupreanof silt loams, 20 to 70 percent slopes

Composition

Tolstoi, Foad, Kupreanof and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Characteristics of Tolstoi Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Tolstoi is on the erosional areas.
Slope range: 20 to 70 percent
Slope features: steep to very steep
Organic mat on surface: 5 inches (13 cm) thick
Native vegetation: Sitka alder

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 6 inches (5 to 15 cm)—dark brown gravelly silt loam
*6 to 11 inches (15 to 28 cm)—dark brown very gravelly silt loam
*11 to 19 inches (28 to 48 cm)—dark brown very cobbly silt loam
*19 inches (48 cm)—schist bedrock

Soil creep has resulted in mixing and churning of horizons in many profiles.

Depth class: shallow—14 to 20 inches (36 to 51 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 6 inches (15 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: severe

Characteristics of Foad Soil

Position on landscape: mountainsides
Microtopography: This unit is characterized by soil creep; Foad is in the depositional areas.
Slope range: 20 to 70 percent
Slope features: steep to very steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka alder

Typical profile:
*0 to 2 inches (0 to 5 cm)—dark gray silt loam
*2 to 4 inches (5 to 10 cm)—dark yellowish brown fine sandy loam
*4 to 8 inches (10 to 20 cm)—dark brown gravelly fine sandy loam
*8 to 23 inches (20 to 58 cm)—olive brown very gravelly fine sandy loam
*23 inches (58 cm)—fractured schist over consolidated schist

Soil creep has resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep—20 to 40 inches (51 to 102 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below 8

inches (20 cm)—moderately rapid
Available water capacity: very low
Root-restricting features: bedrock
Runoff: rapid
Hazard of erosion: severe

Characteristics of Kupreanof Soil

Position on landscape: moraines and mountainsides
Slope range: 20 to 70 percent
Slope features: steep to very steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka alder

Typical profile:
*0 to 3 inches (0 to 8 cm)—dark gray silt loam
*3 to 8 inches (8 to 20 cm)—dark reddish brown gravelly sandy loam
*8 to 13 inches (20 to 33 cm)—dark reddish brown very gravelly coarse sandy loam
*13 to 22 inches (33 to 56 cm)—dark brown very gravelly coarse sandy loam
*22 to 60 inches (56 to 152 cm)—dark brown very cobbly sandy loam

Soil creep has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below 8 inches (20 cm)—moderately rapid
Available water capacity: low
Runoff: rapid
Hazard of erosion: moderate to severe

Included Areas

Contrasting inclusions:
*soils in depressions that are poorly drained
*soils on adjacent sideslopes that have bedrock at a depth of less than 14 inches (36 cm)
*steep-walled V-notch drainages
*avalanche chutes
*rock outcroppings

Major Uses

Current uses: recreation and wildlife habitat

Major Management Factors

Soil-related factors: slope and depth to bedrock
Elevation: 2500 to 3000 feet (762 to 914 m)
Climatic factors (average annual):
*precipitation—60 to 120 inches (152 to 305 cm)
*air temperature—35 to 37 °F (2 to 3 °C)
*growing degree days—less than 500

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

142—Tsirku-Hollow-Funter complex, 0 to 5 percent slopes

Composition

Tsirku and similar inclusions: 55 percent
Hollow and similar inclusions: 15 percent
Funter and similar inclusions: 15 percent
Contrasting inclusions: 15 percent

Characteristics of Tsirku Soil

Position on landscape: floodplains and outwash plains
Slope range: 0 to 5 percent
Slope features: plane
Organic mat on surface: 1 inch (3 cm) thick
Native vegetation: black cottonwood and Sitka spruce

Typical profile:
*0 to 1 inch (0 to 3 cm)—dark grayish brown silt loam
*1 to 41 inches (3 to 104 cm)—dark grayish brown silt stratified with thin lenses of dark grayish brown fine sand and very dark gray silt loam
*41 to 60 inches (104 to 152 cm)—olive gray extremely gravelly sand

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat poorly drained
Permeability: in the upper part—moderate; below 41 inches (104 cm)—rapid
Available water capacity: moderate
Root-restricting features: water table
Runoff: slow
Hazard of erosion: slight
Depth to water table: in May through August—18 to 30 inches (46 to 76 cm); rest of the year—below 40 inches (102 cm)
Hazard of flooding: frequent—April to September

Characteristics of Hollow Soil

Position on landscape: floodplains and outwash plains
Slope range: 0 to 5 percent
Slope features: plane
Organic mat on surface: 1 inch (3 cm) thick
Native vegetation: black cottonwood

Typical profile:
*0 to 1 inch (0 to 3 cm)—dark brown gravelly sandy loam
*1 to 16 inches (3 to 41 cm)—dark grayish brown very gravelly sand stratified with thin lenses of silt
*16 to 60 inches (41 to 152 cm)—dark grayish brown extremely gravelly sand stratified with thin lenses of silt

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat poorly drained
Permeability: in the upper part—moderate; below 1 inch (3 cm)—rapid
Available water capacity: very low
Root-restricting features: water table
Runoff: slow
Hazard of erosion: slight
Depth to water table: in May through August—18 to 30 inches (46 to 76 cm); rest of the year—below 40 inches (102 cm)
Hazard of flooding: frequent—April to September

Characteristics of Funter Soil

Position on landscape: floodplains
Microtopography: muskegs
Slope range: 0 to 5 percent
Slope features: concave
Native vegetation: sphagnum moss

Typical profile:
*0 to 12 inches (0 to 30 cm)—light olive brown sphagnum peat
*12 to 24 inches (30 to 61 cm)—light yellowish brown peat
*24 to 42 inches (61 to 107 cm)—dark brown peat
*42 to 60 inches (107 to 152 cm)—grayish brown silt

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly drained
Permeability: in the upper part—assumed to be rapid; below 42 inches (107 cm)—moderate
Available water capacity: very high
Root-restricting features: water table
Runoff: very slow
Hazard of erosion: slight
Depth to water table: 0 to 12 inches (0 to 30 cm)
Hazard of flooding: frequent—April to September

Included Areas

Contrasting inclusions:
*soils on adjacent floodplains that are moderately well or well drained
*gravel bars and riverwash
*ponded areas
*gravel pits

Major Uses

Current uses: wildlife habitat, forestry, and recreation

Major Management Factors

Soil-related factors: flooding and depth to water table
Elevation: 0 to 1000 feet (0 to 305 m)
Climatic factors (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry (Tsirku Soil)

Principal tree species: black cottonwood and Sitka spruce
Common forest understory plants: Sitka alder, highbush cranberry, red-osier dogwood, horsetail, devil's club, trifoliate foam flower, prickly rose, and twisted-stalk
Habitat types (Viereck and Dyrness 1982): black cottonwood/Sitka alder-highbush cranberry and Sitka spruce/Sitka alder-devil's club/oak fern-spinulose shield-fern
Mean site index (100-year site curve) for stated species (and source): Sitka spruce—95 (*Meyer 1937*) and 96 (*Taylor 1934*)
Mean site index (50-year site curve) for stated species: black cottonwood—80 (*British Columbia Forest Service 1977*)
Estimated highest average production for stated species (and source): black cottonwood—35 cubic feet/acre/year at age 60 (*British Columbia Forest Service 1977*); Sitka spruce—112 cubic feet/acre/year at age 70 (*Meyer 1937*) and 109 cubic feet/acre/year at age 70 (*Taylor 1934*)

Operability considerations:
*The main physical limitations to harvesting are frequent flooding and a seasonal high water table.

*Compaction and puddling can be expected to a severe degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a moderate degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install culverts or other drainage structures to improve road utility and reduce the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil compaction, puddling, and displacement.

Silvicultural considerations:
*Frequent flooding and a seasonal high water table reduce the survival of planted or naturally established seedlings.
*If seed trees are present, natural regeneration of black cottonwood and Sitka spruce occurs readily.
*Because rooting depth is restricted by the seasonal high water table, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can prevent the establishment of seedlings.

Suitable management practices:
*Reforest by planting Sitka spruce seedlings from adapted parent stock.
*Replace mortality to fully occupy the site.
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.

Forestry (Hollow Soil)

Principal tree species: black cottonwood
Tree species of limited extent: Sitka spruce
Common forest understory plants: Sitka alder, one-sided wintergreen, liver-leaf wintergreen, highbush cranberry, bluntseed sweetroot, red-osier dogwood, horsetail, and sweet-scented bedstraw
Habitat types (Viereck and Dyrness 1982): black cottonwood/Sitka alder-highbush cranberry
Mean site index (50-year site curve) for stated species: black cottonwood—73 (*British Columbia Forest Service 1977*)
Estimated highest average production for stated species (and source): black cottonwood—35 cubic feet/acre/year at age 60 (*British Columbia Forest Service 1977*)

Operability considerations:
*The main physical limitations to harvesting are frequent flooding and a seasonal high water table.
*Compaction and puddling can be expected to a slight degree from equipment and logs that repeatedly contact the ground.
*Displacement of the surface layer can be expected to a severe degree from improper or repeated use of equipment.
*Surface erosion from unprotected, bared areas can be expected to a slight degree.
*Winter and spring snowpack may be limiting from November to March.

Suitable harvesting practices:
*Use conventional wheeled and tracked equipment for harvesting.
*Install culverts or other drainage structures to improve road utility and reduce the cost of road maintenance.
*Overlay roads with gravel to support repeated, long-term use.
*Layout skid trails carefully, properly time their use, and use low pressure ground equipment to reduce the hazard of soil displacement.

Silvicultural considerations:
*Frequent flooding and a seasonal high water table reduce the survival of planted or naturally established seedlings.
*If seed trees are present, natural regeneration of black cottonwood occurs readily.
*Because rooting depth is restricted by the periodic high water table, trees are occasionally subject to windthrow when the soil is wet and winds are strong.
*When openings are made in the canopy, invading brushy plants, if not controlled, can prevent the establishment of seedlings.

Suitable management practices:
*Salvage harvest blowdown promptly to reduce wood loss to decay.
*Control unwanted, competing vegetation by mechanical or chemical means.

Forestry (Funter Soil)

This soil does not support forestland vegetation.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, beaver, bald eagles, and a variety of other birds and mammals.

143—Typic Cryaquods, 0 to 20 percent slopes

Composition

Typic Cryaquods: 75 percent
Included soils: 25 percent

Characteristics of Typic Cryaquods

Position on landscape: outwash plains
Microtopography: This unit occurs in low-lying areas, benches, and depressions.
Slope range: 0 to 20 percent
Slope features: concave to steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce, western hemlock, black cottonwood, and lodgepole pine

Sample profile:
*0 to 3 inches (0 to 8 cm)—gray silt loam
*3 to 6 inches (8 to 15 cm)—dark reddish brown gravelly silt loam
*6 to 10 inches (15 to 25 cm)—yellowish red gravelly sandy loam
*10 to 23 inches (25 to 58 cm)—olive brown gravelly sandy loam
*23 to 60 inches (58 to 152 cm)—olive gray silty clay loam

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: poorly drained
Permeability: in the upper part—moderate to moderately rapid; below 23 inches (58 cm)—slow
Available water capacity: high
Root-restricting features: water table and dense clay
Runoff: slow to medium
Hazard of erosion: slight
Depth to water table: 0 to 18 inches (0 to 46 cm) for more than two weeks during the growing season

Included Soils

Included are soils with properties that vary widely over short distances. These include shallow to very deep, well drained soils on adjacent outwash plains. They formed in residuum and colluvium from metamorphic rock and granite along with an admixture of organic deposits.

Major Uses

Current uses: wildlife habitat, recreation, forestry, and urban uses

Major Management Factors

Soil-related factors: depth to water table
Elevation: 0 to 800 feet (0 to 244 m)
Climatic factors (average annual):
*precipitation—55 to 65 inches (140 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, paper birch, western hemlock, and lodgepole pine

Operability considerations:
*Tree species and production are highly variable depending on physiographic conditions.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

Urban Uses

Some areas of this map unit are used for homesite development. The main limitations are wetness and steep slopes. An on-site investigation is required to determine suitability for development.

144—Typic Haplocryods, 5 to 20 percent slopes

Composition

Typic Haplocryods: 75 percent
Included soils: 25 percent

Characteristics of Typic Haplocryods

Position on landscape: outwash plains
Slope range: 5 to 20 percent
Slope features: concave to steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce, western hemlock, black cottonwood, and lodgepole pine

Sample profile:
*0 to 2 inches (0 to 5 cm)—grayish brown silt loam
*2 to 3 inches (5 to 8 cm)—dark brown silt loam
*3 to 5 inches (8 to 13 cm)—dark yellowish brown silt loam
*5 to 22 inches (13 to 56 cm)—olive brown silt loam
*22 to 60 inches (56 to 152 cm)—grayish brown silt loam

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: moderately slow to moderately rapid
Available water capacity: moderate to high
Runoff: medium
Hazard of erosion: slight

Included Soils

Included are soils with properties that vary widely over short distances. These include very shallow to deep, well to poorly drained soils on mountainsides, footslopes, and low-lying areas bordering mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite, with an admixture of sphagnum moss, glacial till, and loess.

Major Uses

Current uses: wildlife habitat, recreation, forestry, and urban uses

Major Management Factors

Elevation: 0 to 800 feet (0 to 244 m)
Climatic factors (average annual):
*precipitation— 55 to 65 inches (140 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, paper birch, western hemlock, and lodgepole pine

Operability considerations:
*Tree species and production are highly variable depending on physiographic conditions.
*The main physical limitation to harvesting is snowmelt in spring.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

Urban Uses

Some areas of this map unit are used for homesite development. The main limitations are wetness and steep slopes. An on-site investigation is required to determine suitability for development.

145—Typic Haplocryods, 20 to 40 percent slopes

Composition

Typic Haplocryods: 75 percent
Included soils: 25 percent

Characteristics of Typic Haplocryods

Position on landscape: outwash plains
Slope range: 20 to 40 percent
Slope features: steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce, western hemlock, black cottonwood, and lodgepole pine

Sample profile:
*0 to 2 inches (0 to 5 cm)—grayish brown silt loam
*2 to 3 inches (5 to 8 cm)—dark brown silt loam
*3 to 5 inches (8 to 13 cm)—dark yellowish brown silt loam
*5 to 22 inches (13 to 56 cm)—olive brown silt loam
*22 to 60 inches (56 to 152 cm)—grayish brown silt loam

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: moderately slow to moderately rapid
Available water capacity: moderate to high
Runoff: rapid
Hazard of erosion: severe

Included Soils

Included are soils with properties that vary widely over short distances. These include very shallow to deep, well to poorly drained soils on mountainsides, footslopes, and low-lying areas bordering mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite, with an admixture of sphagnum moss, glacial till, and loess.

Major Uses

Current uses: wildlife habitat, recreation, and forestry

Major Management Factors

Elevation: 0 to 800 feet (0 to 244 m)
Climatic factors (average annual):
*precipitation— 55 to 65 inches (140 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, paper birch, western hemlock, and lodgepole pine

Operability considerations:
*Tree species and production are highly variable depending on physiographic conditions.
*The main physical limitations to harvesting are steep slopes and snowmelt in spring.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

146—Typic Haplocryods-Histic Cryaquepts complex, 5 to 20 percent slopes

Composition

Typic Haplocryods: 40 percent
Histic Cryaquepts: 35 percent
Included soils: 25 percent

Characteristics of Typic Haplocryods

Position on landscape: outwash plains
Slope range: 5 to 20 percent
Slope features: concave to steep
Organic mat on surface: 2 inches (5 cm) thick
Native vegetation: Sitka spruce, western hemlock, black cottonwood, and lodgepole pine

Sample profile:
*0 to 2 inches (0 to 5 cm)—grayish brown silt loam
*2 to 3 inches (5 to 8 cm)—dark brown silt loam
*3 to 5 inches (8 to 13 cm)—dark yellowish brown silt loam
*5 to 22 inches (13 to 56 cm)—olive brown silt loam
*22 to 60 inches (56 to 152 cm)—grayish brown silt loam

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: very deep
Drainage class: well drained
Permeability: moderately slow to moderately rapid
Available water capacity: moderate to high
Runoff: medium
Hazard of erosion: slight

Characteristics of Histic Cryaquepts

Position on landscape: outwash plains
Microtopography: This unit occurs in low-lying areas and depressions.
Slope range: 0 to 20 percent
Slope features: concave to steep
Organic mat on surface: 9 inches (23 cm) thick
Native vegetation: Sitka spruce, western hemlock, black cottonwood, and lodgepole pine

Sample profile:
*9 to 5 inches (23 to 13 cm)—decomposed moss, roots, and forest litter
*5 inches to 0 (13 cm to 0)—partially decomposed roots and moss
*0 to 4 inches (0 to 10 cm)—black mucky silt loam
*4 to 10 inches (10 to 25 cm)—dark grayish brown and very dark gray gravelly silt loam
*10 to 60 inches (25 to 152 cm)—dark grayish brown and light yellowish brown very cobbly silt loam

Windthrow has resulted in mixing and churning of horizons in many profiles.

Depth class: moderately deep to very deep—20 to more than 60 inches (51 to more than 152 cm) over bedrock
Drainage class: very poorly to poorly drained
Permeability: moderately slow to moderately rapid
Available water capacity: low to high
Root-restricting features: water table and bedrock

Runoff: slow to medium
Hazard of erosion: slight
Depth to water table: 0 to 18 inches (0 to 46 cm)

Included Soils

Included are soils with properties that vary widely over short distances. These include shallow to very deep, skeletal and nonskeletal soils on adjacent mountain sideslopes. They formed in residuum and colluvium from metamorphic rock and granite along with an admixture of organic deposits.

Major Uses

Current uses: wildlife habitat, recreation, and forestry

Major Management Factors

Soil-related factors: depth to water table and depth to bedrock

Elevation: 0 to 800 feet (0 to 244 m)
Climatic factors (average annual):
*precipitation—55 to 65 inches (140 to 165 cm)
*air temperature—40 to 43 °F (4 to 6 °C)
*growing degree days—more than 1500

Forestry

Principal tree species: Sitka spruce, paper birch, western hemlock, and lodgepole pine

Operability considerations:
*Tree species and production are highly variable depending on physiographic conditions.
*The main physical limitation to harvesting is a high water table.

Wildlife Habitat

This unit provides habitat for moose, black bear, brown bear, porcupine, wolf, and a variety of other birds and mammals.

Figures

Figure 1--Hollow and Skagway sandy loams are on the floodplains in the foreground. Kupreanof and Foad soils are on the mountain slopes at the left center.

Figure 2--Kupreanof-Foad complex, 40 to 70 percent slopes, is on the mountain slopes at the left; and Lutak-Kupreanof complex, 2 to 20 percent slopes, is in the center. Chilkoot Lake is in the background.

Figure 3--Kupreanof-Foad complex, 2 to 20 percent slopes, is in the foreground. Ferebee-Rock outcrop complex, 5 to 90 percent slopes, is on the upper mountain slopes in the distance.

Figure 4--Nataga-Cryorthents association, 20 to 40 percent slopes, on an alluvial fan.

Figure 5--Lutak-Kupreanof association is on the stream terrace and moraine in the foreground, and Ashmun-Funter association is in the valley bottom. Rock outcrop-Lithic Cryorthents complex is on the mountain slopes in the distance.

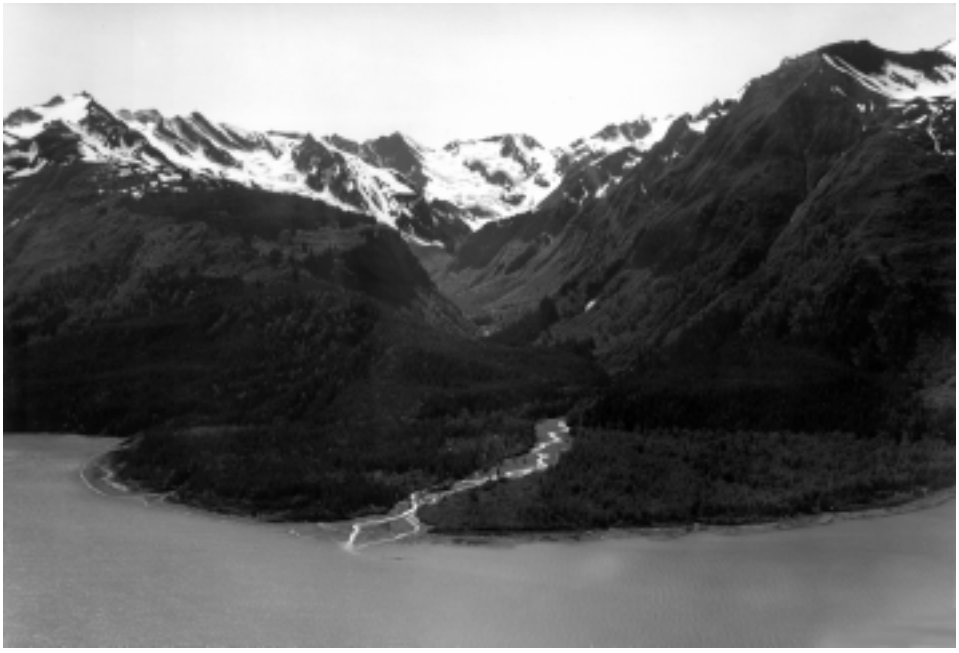

Figure 6--Nataga-Cryorthents association, 0 to 20 percent slopes, is on the alluvial fan in the center. Kupreanof-Foad complex, 40 to 70 percent slopes, is on the mountain slopes in the distance.

Figure 7--Tolstoi-Foad complex is on the mountainsides in the background; Davidson glacier is in the center; and Nataga-Cryorthents association is in the foreground.

Figure 8--Cryorthents, 20 to 180 percent slopes, on steep avalanche prone mountainsides.

Figure 9--Tolstoi-Rock outcrop complex is on the mountain slopes in the background; Tolstoi-Foad complex is at mid-slope in the center; and Kupreanof-Foad complex is on the moraine in the foreground.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. It can also help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, foresters, biological technicians, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for forestry, woodland, recreation and wildlife habitat, and sites for highways and other transportation systems. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Highway officials, engineers, and others may also find this survey useful in locating sites for pavements, sidewalks, campgrounds, and trees and shrubs.

Forest Productivity and Management[2]

Prepared by Branislav Lalich and Lyn R. Townsend, Foresters, Natural Resources Conservation Service

Lands within the soil survey area are owned by the State of Alaska and managed by the Alaska Department of Natural Resources. Historically, logging has supported sawmills in the Haines area on an intermittent basis, and has consisted, in part, of manufacturing cants from western hemlock and Sitka spruce logs for overseas markets. Some black cottonwood is harvested for pulpwood.

The access road system that serves the area is presently very limited. Clearcutting is the typical harvest-regeneration method. Wheeled and tracked skidders are used to harvest areas that are generally less than 30 percent in slope gradient; cable yarding systems are used for slopes greater than 30 percent.

Forest Vegetation

The major forest type (*Viereck and Dyrness 1982*) of commercial importance in the soil survey area is the western hemlock-Sitka spruce type. It consists of pure stands of western hemlock as well as pure stands of Sitka spruce. The two species can also be found in mixed stands from valley bottom to timberline. Stands commonly consist of decadent, old growth trees with diameters-at-breast-height (dbh) of over 30 inches (over 76 cm). Heart-rot and dwarf mistletoe are prevalent in western hemlock at all elevations. In Sitka spruce, heart-rot created a problem in finding suitable trees for measuring site index. After clearcutting in this forest type, invading alders and willows and existing understory species may totally occupy the logged site. Western hemlock and Sitka spruce will reseed from the periphery of the logged area, but adequate stocking may not be readily attained because of the brush competition. Eventually the conifers will overtop the brush, with the new stand usually consisting of a higher proportion of the slightly more shade-tolerant western hemlock.

Common understory plants of the western hemlock-Sitka spruce type include devil's club, early blueberry, rusty menziesia, salmonberry, five-leaf bramble, western thimbleberry, spinulose shield-fern, highbush cranberry, bunchberry dogwood, twisted-stalk, currant, and several pyrola. Mosses and ferns typically carpet the forest floor to a depth of 2 to 3

[2] Scientific names of plants mentioned in the text and in Table 5 are given in Table 13.

inches (5 to 8 cm) to mineral soil. Soil series having this type include Chilkoot, Foad, Krubate, Kupreanof, and Tolstoi.

A second forest type, black cottonwood, occurs on alluvial bottomlands and gravel bars of streams and rivers. Stands are usually pure with trees up to 36 to 40 inches (91 to 102 cm) dbh and 120 feet (37 m) in height. Decadent trees with broken tops and heart-rot are common. The understory typically consists of Sitka alder, red-osier dogwood, russet buffaloberry, Douglas maple, sweet-scented bedstraw, horsetail, and rose. Tree litter and dead leaves cover the ground surface. Open areas are typically occupied by mountain avens. Soil series having this type include Ashmun, Hollow, and Skagway. The Nataga and Tsirku series can have either the black cottonwood or western hemlock-Sitka spruce type.

A minor forest type, lodgepole pine, occupies steep, shallow soils intermixed with rock outcrop at the head of Lynn Canal above the Haines highway paralleling the Chilkat River. It is also found in scattered bogs in mountainside depressions in the Mosquito Lake area. Quality is poor with trees rarely exceeding 35 feet (11 m) in height and 6 to 8 inches (15 to 20 cm) dbh. This forest type is presently of little commercial importance; however, it may have local use for Christmas trees. The total area of lodgepole pine is less than 600 acres.

Extensive stands of alder occupy areas of excessive soil disturbance such as avalanche tracks and recently logged areas. Paper birch and quaking aspen are associated minor species throughout the survey area. Mountain hemlock, though not a common species, grows from sea level to timberline. Mountain hemlock stands observed were of poor quality. No measurements were made because of the absence of suitable trees. Near timberline, mountain hemlock is a shrub.

Forestry-Soil Interpretations

Soil surveys are becoming increasingly more important to forest managers as they seek ways to improve the productivity and management of their lands and for planning the most efficient use of forest resources. Certain soils have a higher potential productivity, some are more susceptible to compaction and erosion during and after harvesting, and others require special efforts to reforest. The detailed descriptions of the soil map units of the survey area list important forestry interpretations.

Each map unit suitable for producing wood crops has information in its description concerning forest vegetation and productivity, limitations for harvesting timber, suitable logging practices, silvicultural considerations, and suitable forest growth and management practices. The methods and procedures used by foresters and soil scientists to develop this information are contained in the Natural Resources Conservation Service's *National Forestry Manual* (*United States Department of Agriculture 1983*) and applicable State supplements.

Table 5 summarizes much of the forestry information given in the map unit descriptions and serves as a quick reference for the more important forestry interpretations. Only those soils suitable for wood crops are listed. The *ordination (forestland suitability) symbol* is based on a uniform system that groups and labels soils based on potential productivity and principal soil properties in relation to any hazards or limitations of that soil. All soils having the same ordination symbol have about the same potential productivity and require the same general kinds of management.

The first element of the ordination symbol, *productivity class*, is a number that denotes potential productivity in terms of cubic meters of wood per hectare per year for the indicator tree species (the first species listed for a particular map unit and generally the most productive on the soil). Potential productivity is based on site index and the corresponding culmination of mean annual increment. For example, 1 would mean 1 cubic meter of wood per hectare per year (14.3 cubic feet per acre per year), and 10 would mean the soil has potential for producing 10 cubic meters of wood per hectare per year (143 cubic feet per acre per year).

The second element of the symbol, *subclass*, is a capital letter that indicates the major kind of soil limitation for forest management or tree growth. The letter W indicates excessive water in or on the soil; X indicates restrictions because of rocks or stones; and R indicates restrictions due to steep slopes. The letter A indicates few or no limitations or restrictions.

In Table 5, the soils are also rated for a number of factors to be considered in use and management. *Slight*, *moderate,* and *severe* are used to indicate the degree of major soil limitations. For each *moderate* or *severe* rating, a statement in the applicable soil map unit explains the soil factor or factors that are the basis of that rating.

Erosion hazard ratings refer to the risk of water erosion and soil loss in well managed forests. A rating of *slight* indicates that expected soil loss is small and no particular preventive measures are needed under ordinary conditions; *moderate* indicates measures are needed to control erosion during timber harvesting and road construction to prevent site degradation; and *severe* indicates that intensive management or special equipment and methods are needed to prevent excessive erosion.

Equipment limitations ratings refer to the limits on the operability and use of wheeled and tracked equipment as a result of soil characteristics. A rating of *slight* indicates that equipment use is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation due to soil wetness, a fluctuating water table, or some other factor; and *severe* indicates a longer seasonal limitation, a need for special equipment (such as cable-yarding logging systems), or a hazard in the use of equipment.

The most obvious limitation to the use of equipment is slope. As slope gradient increases, the operability of wheeled equipment becomes restricted and tracked equipment must be used. On the steepest slopes, even tracked equipment cannot operate safely and more sophisticated harvesting systems must be used. Soil wetness, especially in combination with fine texture, can severely limit the use of equipment during the spring and early summer months.

Seedling mortality ratings refer to the probability of death of tree seedlings as influenced by kinds of soil or topographic conditions. The ratings apply to healthy seedlings that are naturally established or properly planted during periods of sufficient soil moisture. *Slight* indicates no problem is expected under normal conditions; *moderate* indicates some mortality can be expected and extra precautions are advisable; and *severe* indicates that mortality will be high and extra precautions are essential for successful reforestation. Plant competition is not considered in the ratings.

Soil wetness, due to a high water table or saturated soil conditions, is a major factor contributing to seedling mortality problems. Another major factor to mortality is droughtiness of the surface layer, especially on south- or southwest-facing slopes or ridgetop locations. Special site preparation, larger seedling stock, or reinforcement plantings may be needed on soils with moderate and severe seedling mortality hazard.

Windthrow hazard ratings consider soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. Windthrow hazard is highly variable and depends largely on the frequency and duration of strong winds; turbulence and wind funneling created by topography; orographic effects; cutting boundary patterns; and tree height and density. Restricted rooting depth due to a high water table, underlying bedrock or an impervious layer is the principal soil factor causing windthrow hazard or tree tipover.

A rating of *slight* indicates that trees are not normally blown down by wind although strong wind may break trees but not uproot them; *moderate* indicates that an occasional tree may blow down during periods of excessive wetness combined with moderate or strong winds; and *severe* indicates that many trees may blow down during such periods. Soils with *moderate* and *severe* ratings require more caution in thinning operations, contingency plans for periodic salvage of windthrown trees, and an adequate road and trail system to allow for salvage operations.

Plant competition ratings refer to the likelihood of invasion or growth of understory plants that would inhibit reforestation and stand development when openings are made in the tree canopy. A rating of *slight* indicates that understory plants are not likely to delay natural reforestation, and planted seedlings have good prospects for development without undue competition; *moderate* indicates that plant competition will delay natural or planted reforestation; and *severe* indicates that competition can prevent natural or planted reforestation.

Favorable climate and soil moisture characteristics, and the naturally occurring vegetation on a soil, account for plant competition problems. In many cases, the key to predicting plant competition problems is the quantity and proximity of seed sources of undesirable plants, or the quantity of unwanted brush rootstocks that will resprout after harvest activities. *Moderate* and *severe* ratings indicate the need for careful and thorough post-harvest clean-up in preparation for reforestation, and possibly for biological, mechanical, or chemical treatments to retard growth of competing vegetation and allow seedlings to develop.

The *potential productivity* of *important trees* on a soil is expressed as *site index*. Site index, estimated by taking height and age measurements on dominant and codominant trees within the stand, is expressed as the total height growth in feet at 100 years. This index applies to well stocked, even-aged, unmanaged stands on a particular soil. The procedures and equations for estimating site index are given in the publications used for indicator species of the soil survey area (*Barnes 1962, Meyer 1937, Taylor 1934,* and *British Columbia Forest Service 1977*). Cubic-foot volume per acre is determined by converting site index into estimated yield using volume tables and equations given in Barnes (*1962*), Meyer (*1937*), Taylor (*1934*), and British Columbia Forest Service (*1977*). Volumes given in Table 5 are estimates of potential volume only; actual stand volume will vary from stand to stand and must be measured in the field. *Productivity class* denotes potential productivity of the soils based on site index and mean annual increment; higher numbers indicate more productive soils. Productivity classes are used to group similar soils within a survey area, as well as compare soils from different geographic areas. Important trees are listed in the same order as that of their general occurrence observed on the soil map unit. Usually, only one or two tree species will

predominate.

Trees to plant are those that are planted for reforestation or, if suitable conditions exist, allowed to naturally regenerate themselves. Species listed are suited to the soils and will produce a commercial wood crop. Desired product, topographic position (such as ridgetop), and personal preference are three factors of many that can influence the choice of adapted trees to use for reforestation.

Recreation

The soils of the survey area are rated in Table 6 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area; the size and shape of the area and its scenic quality; the ability of the soil to support vegetation; access to water; potential water impoundment sites; and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. On-site assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

In Table 6, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas; stabilizing roads and intensively used areas; and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The soils are rated on soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The soils are rated on soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones, and that can withstand heavy foot traffic and maintain an adequate cover of vegetation. The soils are rated on soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should readily absorb rainfall, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

Wildlife Habitat

Prepared by Devony Lehner, District Conservationist, Natural Resources Conservation Service

Three distinct physiographic regions are found in the soil survey area, each characterized by its own variety of flora, habitats, and fauna.

Floodplains

Riparian and floodplain plant communities, along with adjoining wetlands, provide food, shelter, and breeding environments for a rich variety of birds and mammals. Riverine environments provide herbaceous, shrubby, and forested habitats, both in relatively pure stands and in mosaic-like combinations caused by windthrow, shift in river channels, and avalanches.

The black cottonwood forest type, particularly old-growth stands, provides excellent habitat for big game—moose, Sitka black-tailed deer, brown and black bears, and wolf; furbearers—coyote, lynx, marten, mink, ermine, red fox, beaver, muskrat, and river otter; small game—snowshoe hare, northern-flying and red squirrels, porcupine, and grouse; and raptors—sharp-shinned hawk, goshawk, great-horned and boreal owls, red-tailed hawk, osprey, and great gray owl. The latter three species nest in the forest

but feed in meadows or streams. In addition, the black cottonwood forest type provides habitat for shrews, mice, and voles (prey for furbearers and raptors), as well as numerous species of birds—Canada goose, common goldeneye, mergansers, gulls, woodpeckers, and a large variety of songbirds. One of the world's largest concentrations of bald eagles is found in floodplain forests on the Chilkat River flats below Klukwan. Fed by late runs of coho and chum salmon in the Chilkat River and other spring-fed streams, thousands of bald eagles congregate in the riverine forests near Haines from October through January.

Floodplains also provide shrubland and herbaceous habitats along stream channels and in forest openings. Shrublands along rivers are commonly used for food and cover by moose, brown and black bears, wolf, coyote, beaver, muskrat, river otter, mink, lynx, red fox, and snowshoe hare; and shrubland birds, including willow ptarmigan, alder flycatcher, Wilson's warbler, redpolls, American robin, several species of sparrows and thrushes, and others. Moose also feed in nearby floodplain marshes such as horsetail-sedge communities, and cow moose frequently calve in riparian muskegs and bogs. Riparian marshes provide important nesting, feeding, and staging areas for shorebirds and waterfowl, including great blue heron, common and red throated loons, Canada goose, mallard, pintail, green-winged teal, killdeer, greater and lesser yellowlegs, common snipe, and sandpipers and terns. Herbaceous communities, both marshes and drier communities of grasses, herbs, and young shrubs that thrive in clearings, can provide abundant food for deer mouse, voles, and lemmings, along with predators such as mink, weasels, red fox, river otter, marsh hawk, and short-eared owl. Ground-feeding or -nesting birds, such as dark-eyed junco, winter wren, and sparrows are also found in these areas.

In general, the variety and abundance of floodplain wildlife in a particular area will reflect the geographic intermixing and local conditions of forest, shrub, and marsh habitats available. Plant communities characterized by well-developed understories and many layers of vegetation, such as old-growth forests and edges between some habitat types, will support the most varied fauna; while recently disturbed clearings, closed-canopy second-growth forests, and communities with low understory productivity and variety and few vegetative layers, will support fewer kinds of wildlife.

Mountainsides and Moraines

Mountain sideslope forests can support a fauna very similar to that found in floodplain forests, although water-dependent species, such as river otter, mink, bald eagle, and beaver, will not be present except near mountain streams. Black bear, brown bear, moose, Sitka black-tailed deer, wolf, marten, coyote, wolverine, lynx, red fox, snowshoe hare, porcupine, red squirrel, northern-flying squirrel, and mice and voles may all be found in sideslope forests, along with a variety of raptors, woodpeckers, game birds, and song birds.

Where cranberry, currant, crowberry, and salmonberry are abundant, bears, fox, hare, and seed-eating birds are numerous. Where shrubs (particularly willow) and young quaking aspen and paper birch trees dominate the understory, moose, hare, and their predators will be more common. Forests with productive herb-grass groundcover support relatively large numbers of rodents and their predators—weasels, fox, coyote, wolverine, and marten. Generally, forest understories on south-facing slopes will be more productive and diverse than those on cooler, north-facing slopes, and will support a greater number and variety of wildlife.

Sideslopes supporting dense alder shrublands provide food and/or cover for moose, bears, coyote, wolf, wolverine, and other wide-ranging mammals; however, these areas generally have poorly developed understories and provide little food to rodents and their predators. Birds common to alder shrublands include alder flycatcher, redpolls, and several species of sparrows.

Sideslopes supporting sphagnum bogs and muskegs, which develop on level poorly drained sites, usually contain willow shrubs, bog blueberry, bog cranberry, grasses, sedges, and other forbs that provide valuable food for moose, deer, bears, and many rodents and their predators. Cow moose frequently calve on or near muskegs in May and June, while blue grouse rear their young along muskeg margins. A number of waterfowl and shorebirds nest in muskeg lakes and ponds, including loons, grebes, ducks, geese, and swans. These sideslope communities generally support more numbers and kinds of wildlife than alder shrublands but, because they lack a well-developed tree layer, support fewer species than most forests.

Alpine Areas

Alpine plant communities consisting of bunchgrasses, herbs, and dwarf shrubs adapted to winds, cold temperatures, shallow soils, and short growing seasons appear above sideslope shrublands and forests. Dwarf shrubs, particularly willows and bog birch, provide valuable summer forage for moose while alpine shrubs and herbs are important to

mountain goats. As salmon runs end in the fall, ripening berries bring black and brown bears up to alpine areas from fishing streams in the lowlands. Talus slopes near herbaceous or dwarf shrub communities support collared pika and hoary marmot. Wolverine, wolf, coyote, and brown bear prey on these tundra rodents as well as on moose and mountain goats. Ermine, red fox, and least weasel can also be found in alpine areas hunting shrews, rodents, birds, and insects. Birds that nest or rear young in alpine habitats include rock and white-tailed ptarmigans, blue grouse, lesser golden plover, upland sandpiper, rosy finch, water pipit, snow bunting, and Lapland longspur. Golden eagle, rough-legged hawk, gyrfalcon, long-tailed jaeger, snowy owl, and common raven hunt tundra rodents and/or nesting birds. Many of these species use these areas only during late spring, summer, or early fall when alpine habitats support a diverse, seasonal fauna.

Engineering

This section provides information for planning land uses related to urban development and water management. Soils are rated for construction materials. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section (page 83).

Information in this section is intended for land use planning, evaluating land use alternatives, and planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for on-site investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing this section. Local ordinances and regulations should be considered in planning, site selection, and design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; plan detailed on-site investigations of soils and geology; and locate potential sources of gravel, sand, earthfill, and topsoil.

The information in the tables, along with the soil maps, soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the glossary (page 111).

Construction Materials

Table 7 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is excavated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. Soil performance after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed soil performance. The thickness of suitable material is a major consideration. Large stones, a high water table, and slope affect the ease of excavation. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the

engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, slopes of more than 25 percent, or a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In Table 7, only the probability of finding material in suitable quantity in or below the soil is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel, or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Toxic material and such properties as soil reaction, available water capacity, and fertility affect plant growth. Rock fragments, slope, a water table, soil texture, and thickness of suitable material affect the ease of excavating, loading, and spreading. Slope, a water table, rock fragments, bedrock, and toxic material affect reclamation of the borrow area.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in soluble salt content, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils; loamy soils that are relatively high in clay; soils that have only 20 to 40 inches of suitable material; soils that have an appreciable amount of gravel, stones, or soluble salts; or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey; have less than 20 inches of suitable material; have a large amount of gravel, stones, or soluble salts; have slopes of more than 15 percent; or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data, and the estimates of soil and water features listed in Tables 10 and 11, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in Table 8.

Estimates of soil properties are based on field examinations, laboratory tests of samples from the survey area, and laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 8 gives estimates of the engineering classification and the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series, Higher Taxa, and Their Morphology" (page 89).

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the glossary (page 111).

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*American Association of State Highway and Transportation Officials 1982*) and the Unified soil classification system (*American Society for Testing and Materials 1988*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups, from A-1 through A-7, on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 10 inches in diameter, and 3 to 10 inches in diameter, are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074

millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 9 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in this survey.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 °C. In Table 9—Physical and Chemical Properties of the Soils, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. Laboratory analyses verify values for many soils. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract in millimhos per centimeter at 25 °C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly when clay minerals interact with water, and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind

and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the amount of stable aggregates 0.84 millimeter in size. Soils containing rock fragments can occur in any group. The groups are as follows:

1. *1 to 9 percent dry soil aggregates*. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
2. *10 to 24 percent dry soil aggregates*. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. *25 to 39 percent dry soil aggregates*. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.
4. *25 to 39 percent dry soil aggregates with greater than 35 percent clay or greater than 5 percent calcium carbonate*. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. *40 to 44 percent dry soil aggregates*. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. *45 to 49 percent dry soil aggregates*. These soils are very slightly erodible. Crops can easily be grown.
7. *50 percent or more dry soil aggregates*. These soils are very slightly erodible. Crops can easily be grown.
8. Stony, gravelly, or wet soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In Table 9 the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Water Features

Tables 10 gives estimates of several important water features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. The soil properties that affect the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include the depth to a seasonal high water table, intake rate, permeability after prolonged wetting, and depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well or well drained soils that have a moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils that have a moderately fine or fine texture.

These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of soils that have a permanent high water table and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in Table 10, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered to be ponding.

Table 10 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. *None* means flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is 50 percent in any year). The term *common* includes both frequent and occasional flooding.

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very long* (more than 30 days). The time of year that flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods is also considered. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. The depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high are indicated in Table 10. A water table that is seasonally high for less than 1 month is not indicated.

An *apparent* water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time for adjustments in the surrounding soil.

A *perched* water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Soil Features

Table 11 gives estimates of several important soil features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Table 11 shows the expected initial subsidence, which usually is a result of drainage, and annual subsidence, which usually is a result of oxidation. Not shown in the table is subsidence caused by an imposed surface load or by the withdrawal of ground water throughout an extensive area as a result of lowering the water table.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of

segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a *moderate* potential indicates that the soil is susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a *high* potential indicates that the soil is highly susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*Soil Survey Staff 1975*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field, or inferred from those observations, or from laboratory measurements. Table 12 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Inceptisol.

SUBORDER. Each order is divided into suborders primarily based on properties that influence soil genesis and are important to plant growth, or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ochrept (*Ochr*, meaning pale, plus *ept*, from Inceptisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Cryaquepts (*Cry*, meaning cold, plus *aquept*, the suborder of the Inceptisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Cryaquepts.

FAMILY. Families are established within a subgroup based on physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy, mixed Typic Cryaquepts.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series, Higher Taxa, and Their Morphology

This section describes each soil series, or higher taxa, recognized in the survey area. Characteristics of the soil and the material in which it formed are identified for each soil series or higher taxa. A pedon, a small three-dimensional area of soil that is typical of the soil in the survey area, is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (*Soil Survey Division Staff 1993*). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (*Soil Survey Staff 1975*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units" (page 9).

Ashmun Series

Taxonomic class: sandy, mixed Typic Cryaquents
Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly drained
Permeability: in the surface layer—moderate; in the 2C horizon—rapid
Positions on landscape: floodplains and outwash plains
Parent material: alluvium
Slope range: 0 to 5 percent
Elevation: 0 to 1000 feet (0 to 305 m)
Climatic data (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Ashmun silt loam—on a nearly level floodplain at 40 feet (12 m) elevation under forest vegetation.

Oi—2 inches to 0 (5 cm to 0); slightly decomposed black (10YR 2/1) mat of moss, roots, and leaves; abrupt smooth boundary
A—0 to 1 inch (0 to 3 cm); very dark brown (10YR 2/2) silt loam; weak fine granular structure; very friable; nonsticky and nonplastic; many very fine, fine, medium and coarse roots; slightly acid (pH 6.4); abrupt smooth boundary
2Cg1—1 to 7 inches (3 to 18 cm); very dark grayish brown (2.5Y 3/2) loamy fine sand; common medium distinct dark brown (10YR 3/3) mottles; single grain; loose; nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; neutral (pH 6.8); gradual wavy boundary
2Cg2—7 to 21 inches (18 to 53 cm); very dark gray (7.5YR 3/0) sand; few fine prominent dark brown (10YR 3/3) mottles; single grain; loose; nonsticky and nonplastic; common fine and medium roots; water table at 15 inches (38 cm) (6/3/82); slightly effervescent; mildly alkaline (pH 7.4); abrupt wavy boundary
2Cg3—21 to 72 inches (53 to 183 cm); very dark gray (2.5Y N3/) sand; single grain; loose; nonsticky and nonplastic; common fine and medium roots decreasing to few fine roots with depth; strongly effervescent; mildly alkaline (pH 7.4)

Typical Pedon Location

Map unit in which located: 101—Ashmun-Funter association, 0 to 5 percent slopes
Location in survey area: in the SE1/4, NW1/4 of sec. 31, T.30 S., R.59 E., Copper River Meridian

Range in Characteristics

Effervescent: none to strongly
Reaction: slightly acid to moderately alkaline
Organic layer thickness: 1 to 3 inches (3 to 8 cm)

A horizon:
Absent in some pedons

2Cg horizon:
Hue—5Y, 2.5Y, 10YR, or 7.5YR
Value—3 to 5 moist
Chroma—0 to 3 moist
Texture—sand or loamy fine sand
Coarse fragment content—0 to 20 percent
Gravel content—0 to 20 percent
Cobble content—0 to 5 percent
Effervescent—none to strongly

Chilkoot Series

Taxonomic class: sandy, mixed Typic Cryaquents
Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly to poorly drained
Permeability: in the surface layer—moderate; in the 2C horizon—rapid
Positions on landscape: floodplains
Parent material: alluvium
Slope range: 0 to 5 percent
Elevation: 0 to 800 feet (0 to 244 m)
Climatic data (average annual):
*precipitation—55 to 65 inches (140 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Chilkoot silt—on a nearly level floodplain at 50 feet (15 m) elevation under forest vegetation.

Oi—3 inches to 0 (8 cm to 0); partially decomposed twigs, leaves, and moss; abrupt smooth boundary
A—0 to 5 inches (0 to 13 cm); olive gray (5Y 5/2) silt; weak fine subangular blocky structure; very friable; nonsticky and nonplastic; many very fine,

fine, medium, and coarse roots; strongly acid (pH 5.2); abrupt smooth boundary
2Cg—5 to 60 inches (13 to 152 cm); olive gray (5Y 5/2) and dark gray (10YR 4/1) loamy fine sand; single grain; loose; nonsticky and nonplastic; common fine and medium roots decreasing to few fine roots with depth; water table at 18 inches (46 cm) (5/23/83); medium acid (pH 6.0)

Typical Pedon Location

Map unit in which located: 104—Chilkoot-Chilkoot, moderately wet, association, 0 to 5 percent slopes
Location in survey area: in the NE1/4, NE1/4 of sec. 9, T.29 S., R.59 E., Copper River Meridian

Range in Characteristics

Reaction: strongly acid to slightly acid
Organic layer thickness: 1 to 5 inches (3 to 13 cm)

A horizon:
Absent in some pedons

2C horizon:
Hue—5Y, 2.5Y, or 10YR
Value—3 to 6 moist
Chroma—0 to 3 moist
Texture—sand, loamy sand, or loamy fine sand
Coarse fragment content—0 to 20 percent
Gravel content—0 to 20 percent
Cobble content—0 to 5 percent

Cryorthents

Taxonomic class: Cryorthents
Depth class: very shallow to very deep—7 to more than 60 inches (18 to more than 152 cm) over bedrock
Drainage class: moderately well to well drained
Permeability: moderate to moderately rapid
Positions on landscape: mountainsides
Microtopography: avalanche chutes
Parent material: residuum and colluvium from metamorphic rock
Slope range: 20 to 180 percent
Elevation: 0 to 4000 feet (0 to 1219 m)
Climatic data (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—41 °F (5 °C)
*growing degree days—1500

Sample Pedon

Cryorthents—on a SW facing slope of 36 percent at 500 feet (152 m) elevation under shrubland vegetation

Oi—2 inches to 0 (5 cm to 0); partially decomposed moss; clear smooth boundary
A—0 to 5 inches (0 to 13 cm); very dark gray (10YR 3/1) gravelly silt loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; many fine and medium roots; 15 percent gravel; strongly acid (pH 5.2); clear irregular boundary
2C—5 to 12 inches (13 to 30 cm); dark brown (7.5YR 3/2) and dark grayish brown (10YR 4/2) gravelly coarse sandy loam; massive; friable; nonsticky and nonplastic; common fine and medium roots; 25 percent gravel; strongly acid (pH 5.2); abrupt irregular boundary
R—12 inches (30 cm); fractured metamorphic rock grading into consolidated bedrock

Sample Pedon Location

Map unit in which located: 105—Cryorthents, 20 to 180 percent slopes
Location in survey area: in the SE1/4 of sec. 30, T.26 S., R.56 E., Copper River Meridian

Range in Characteristics

Depth to bedrock: 7 to more than 60 inches (18 to more than 152 cm)
Texture: silt loam, loam, fine sandy loam, sandy loam, coarse sandy loam
Rock fragment content: 0 to 80 percent
Reaction: extremely acid to neutral

Ferebee Series

Taxonomic class: loamy-skeletal, mixed Lithic Ruptic-Entic Cryumbrepts
Depth class: very shallow to shallow—7 to 14 inches (18 to 36 cm) over bedrock
Drainage class: well drained
Permeability: in the surface layer—moderate; below this—moderately rapid
Positions on landscape: mountainsides and mountaintops
Parent material: residuum and colluvium from metamorphic rock
Slope range: 5 to 90 percent
Elevation: 2800 to 4500 feet (853 to 1372 m)

Climatic data (average annual):
*precipitation—120 to more than 300 inches (305 to more than 762 cm)
*air temperature—34 °F (1 °C)
*growing degree days—less than 300

Typical Pedon

Ferebee gravelly silt loam—on an upper mountain sideslope of 30 percent slope under alpine tundra vegetation at 3000 feet (914 m) elevation

Oi—2 inches to 0 (5 cm to 0); partially decomposed mosses and lichens; clear smooth boundary
A1—0 to 3 inches (0 to 8 cm); black (10YR 2/1) gravelly silt loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; many fine and medium roots; 20 percent gravel; very strongly acid (pH 4.6); abrupt irregular boundary
A2—3 to 8 inches (8 to 20 cm); very dark brown (10YR 2/2) very cobbly silt loam; weak fine granular structure; friable; nonsticky and nonplastic; common fine and medium roots; 30 percent gravel, 20 percent cobbles; very strongly acid (pH 4.6); clear irregular boundary
Bw—8 to 12 inches (20 to 30 cm); dark brown (7.5YR 3/4) extremely cobbly silt loam; massive; friable; nonsticky and nonplastic; few fine roots; 40 percent gravel, 25 percent cobbles; medium acid (pH 5.6); abrupt irregular boundary
R—12 inches (30 cm); fractured metamorphic rock grading into consolidated bedrock

Typical Pedon Location

Map unit in which located: 106—Ferebee-Rock outcrop complex, 5 to 90 percent slopes
Location in survey area: in the SE1/4, SW1/4 of sec. 3, T.29 S., R.56 E., Copper River Meridian

Range in Characteristics

Depth to bedrock: 7 to 14 inches (18 to 36 cm)
Reaction: extremely acid to medium acid
Organic layer thickness: 1 to 7 inches (3 to 18 cm)
Umbric epipedon: not continuous within each pedon

A horizon:
Base saturation—assumed to be less than 50 percent

C horizon:
Hue—5Y, 2.5Y, 10YR, 7.5YR, or 5YR
Value—2 to 4 moist
Chroma—4 to 6 moist
Texture—silt loam or fine sandy loam
Coarse fragment content—35 to 70 percent
Gravel content—30 to 65 percent
Cobble content—5 to 40 percent

Foad Series

Taxonomic class: loamy-skeletal, mixed Typic Humicryods
Depth class: moderately deep—20 to 40 inches (51 to 102 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below this—moderately rapid
Position on landscape: mountainsides
Parent material: residuum and colluvium from metamorphic rock
Slope range: 5 to 70 percent
Elevation: 0 to 3000 feet (0 to 914 m)
Climatic data (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Foad silt loam—on a SW facing slope of 8 percent at 300 feet (91 m) elevation under forest vegetation

Oe—2 inches to 0 (5 cm to 0); partially decomposed twigs, leaves, and moss; clear smooth boundary
E—0 to 2 inches (0 to 5 cm); dark gray (10YR 4/1) silt loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; strongly acid (pH 5.4); clear smooth boundary
Bhs1—2 to 4 inches (5 to 10 cm); dark yellowish brown (10YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; strongly acid (pH 5.4); clear smooth boundary
Bhs2—4 to 8 inches (10 to 20 cm); dark brown (7.5YR 4/4) gravelly fine sandy loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; 15 percent gravel; medium acid (pH 5.6); clear smooth boundary
C—8 to 23 inches (20 to 58 cm); olive brown (2.5Y 4/4) very gravelly fine sandy loam; massive; very friable; nonsticky and nonplastic; common very fine, fine, medium and coarse roots decreasing to few fine roots with depth; 30 percent gravel, 10 percent cobbles; medium acid (pH 6.0); clear smooth boundary

R—23 inches (58 cm); fractured schist over consolidated schist

Typical Pedon Location

Map unit in which located: 115—Kupreanof-Foad complex, 2 to 20 percent slopes
Location in survey area: in the SE1/4, SW1/4 of sec. 3, T.29 S., R.56 E., Copper River Meridian

Range in Characteristics

Depth to bedrock: 20 to 40 inches (51 to 102 cm)
Reaction: extremely acid to medium acid
Solum thickness: 7 to 22 inches (18 to 56 cm)
Organic layer thickness: 1 to 5 inches (3 to 13 cm)

A horizon:
Present in some pedons

Bhs and Bs horizons:
There is more than 6 percent organic carbon in the upper 4 inches of the spodic horizon.
Hue—10YR, 7.5YR, 5YR, or 2.5YR
Value—2 to 5 moist
Chroma—1 to 4 moist
Texture—silt loam or fine sandy loam

C horizon:
Absent in some pedons

Taxadjunct Features

Map units—107, 130, 140: On slopes greater than 70 percent, spodic horizons are nondiscernible and are grading into cambic horizons. This is outside the range defined for the series, but this difference does not significantly affect the use or behavior of the soils.

Funter Series

Taxonomic class: loamy, mixed, euic, frigid Terric Sphagnofibrists
Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly drained
Permeability: in the organic material—assumed to be rapid; in the 2C horizon—moderate
Positions on landscape: floodplains and terraces
Microtopography: muskegs
Parent material: fibric organic material from sphagnum moss underlain by loamy mineral materials.
Slope range: 0 to 5 percent
Elevation: 0 to 1000 feet (0 to 305 m)
Climatic data (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Funter peat—on a level muskeg at 162 feet (49 m) elevation under native vegetation of sphagnum moss.

Oi1—0 to 12 inches (0 to 30 cm); light olive brown (2.5Y 5/4) sphagnum peat, dark yellowish brown (10YR 4/4) when pressed; 95 percent fiber, 90 percent rubbed; about 90 percent sphagnum moss fibers, 5 percent sedge, and 5 percent mineral material; strongly acid (ph 5.2); gradual smooth boundary
Oi2—12 to 24 inches (30 to 61 cm); light yellowish brown (2.5Y 6/4) peat, brown (10YR 5/3) when pressed; 90 percent fiber, 80 percent rubbed; about 80 percent sphagnum moss fibers, 15 percent sedge, and 5 percent mineral material; strongly acid (pH 5.2); gradual smooth boundary
Oi3—24 to 42 inches (61 to 107 cm); dark brown (10YR 4/3) peat, light yellowish brown (10YR 6/4) when pressed; 85 percent fiber, 75 percent rubbed; about 75 percent sphagnum moss fibers, 20 percent sedge, and 5 percent mineral material; strongly acid (pH 5.4); clear smooth boundary
2Cg—42 to 60 inches (107 to 152 cm); grayish brown (2.5Y 5/2) silt; massive; very friable; nonsticky and nonplastic; few fine roots; strongly acid (pH 5.4)

Typical Pedon Location

Map unit in which located: 108—Funter Peat, 0 to 5 percent slopes
Location in survey area: in the SE1/4 of sec. 35, T.26 S., R.55 E., Copper River Meridian

Range in Characteristics

Depth to mineral soil: 24 to 50 inches (61 to 127 cm)
Organic material: fibrous peat composed of sphagnum moss, along with sedgesand equisitum stems; soils may be interlayered with thin strata of sapric material, or mineral soil
Reaction: extremely acid to medium acid
Surface tier: fiber content ranges from 90 to 100 percent unrubbed, 75 to 90 percent rubbed
Subsurface tier: fiber content ranges from 85 to 100 percent unrubbed, 75 to 95 percent rubbed

2C horizon:
Texture—silt, silt loam, or sandy loam
Gravel content—0 to 20 percent
Cobble content—0 to 10 percent

Histic Cryaquepts

Taxonomic class: Histic Cryaquepts
Depth class: moderately deep to very deep—20 to more than 60 inches (51 to more than 152 cm) over bedrock
Drainage class: very poorly to poorly drained
Permeability: moderately slow to moderately rapid
Positions on landscape: mountainsides and outwash plains
Microtopography: low-lying areas, muskegs, and depressions
Parent material: colluvium
Slope range: 0 to 20 percent
Elevation: 0 to 2800 feet (0 to 853 m)
Climatic data (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—about 1500

Sample Pedon

Histic Cryaquepts—on a SE facing slope of 6 percent at 300 feet (91 m) elevation under forest vegetation.

Oi—9 to 5 inches (23 to 13 cm); mat of slightly decomposed moss and forest litter; clear smooth boundary
Oe—5 inches to 0 (13 cm to 0); partially decomposed roots and moss; clear smooth boundary
A—0 to 4 inches (0 to 10 cm); black (10YR 2.5/1) mucky silt loam; weak fine subangular blocky structure; very friable; nonsticky and nonplastic; common very fine, fine and medium roots; strongly acid (pH 5.4); clear smooth boundary
C1—4 to 10 inches (10 to 25 cm); dark grayish brown (2.5Y 4/2) and very dark gray (10YR 3/1) gravelly silt loam; massive; friable; nonsticky and nonplastic; few fine roots; 20 percent gravel; strongly acid (pH 5.4); gradual smooth boundary
C2—10 to 60 inches (25 to 152 cm); dark grayish brown (10YR 4/2) and light yellowish brown (2.5Y 6/4) very cobbly silt loam; massive; friable; nonsticky and nonplastic; few fine roots; 30 percent gravel, 20 percent cobbles; water table at 13 inches (33 cm) (6/8/83); strongly acid (pH 5.4)

Sample Pedon Location

Map unit in which located: 109—Histic Cryaquepts, 0 to 20 percent slopes
Location in survey area: in the SE1/4 of sec. 22, T.28 S., R.55 E., Copper River Meridian

Range in Characteristics

Histic Epipedon thickness: 8 to 16 inches (20 to 41 cm)
Depth to bedrock: 20 to more than 60 inches (51 to more than 152 cm)
Texture: silt, silt loam, mucky silt loam, silty clay loam, sandy loam, loamy sand, and fine sandy loam
Rock fragment content: 0 to 60 percent (dominantly cobbles)
Reaction: extremely acid to neutral

Hollow Series

Taxonomic class: sandy-skeletal, mixed Typic Cryofluvents
Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat poorly drained
Permeability: in the surface layer—moderate; below this—rapid
Positions on landscape: floodplains and outwash plains
Parent material: alluvium
Slope range: 0 to 5 percent
Elevation: 0 to 1000 feet (0 to 305 m)
Climatic data (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Hollow gravelly sandy loam—on a nearly level floodplain at 150 feet (46 m) elevation under forest vegetation

Oi—1 inch to 0 (3 cm to 0); mat of slightly decomposed leaves and roots; abrupt smooth boundary
A—0 to 1 inch (0 to 3 cm); dark brown (10YR 3/3) gravelly sandy loam; weak fine granular structure; friable; nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; 25 percent gravel; slightly effervescent; neutral (pH 7.2); clear smooth boundary

C1—1 to 16 inches (3 to 41 cm); dark grayish brown (10YR 4/2) very gravelly sand stratified with thin lenses of silt; single grain; loose; nonsticky and nonplastic; few fine roots; 35 percent gravel, 10 percent cobbles; slightly effervescent; neutral (pH 7.2); clear smooth boundary
C2—16 to 60 inches (41 to 152 cm); dark grayish brown (10YR 4/2) extremely gravelly sand stratified with thin lenses of silt; single grain; loose; nonsticky and nonplastic; few fine roots; 55 percent gravel, 15 percent cobbles; strongly effervescent; neutral (pH 7.2)

Typical Pedon Location

Map unit in which located: 110—Hollow and Skagway soils, 0 to 5 percent slopes
Location in survey area: in the NE1/4, SE1/4 of sec. 2, T.29 S., R.56 E., Copper River Meridian

Range in Characteristics

Stratified material with an assumed irregular decrease in organic carbon content.
Effervescent: none to strongly
Reaction: slightly acid to moderately alkaline
Organic layer thickness: 1 to 3 inches (3 to 8 cm)

A horizon:
Reaction—slightly acid to neutral

C horizon:
Hue—5Y, 2.5Y, or 10YR
Value—3 to 5 moist
Chroma—2 to 4 moist
Texture—sand stratified with lenses of loamy sand, silt loam, and silt
Coarse fragment content—35 to 70 percent
Gravel content—20 to 60 percent
Cobble content—0 to 30 percent
Effervescent—slightly to strongly

Krubate Series

Taxonomic class: sandy-skeletal, mixed Typic Humicryods
Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below this—moderately rapid
Positions on landscape: outwash plains
Parent material: very gravelly glaciofluvial deposits
Slope range: 5 to 70 percent
Elevation: 0 to 800 feet (0 to 244 m)
Climatic data (average annual):
*precipitation—55 to 65 inches (140 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Krubate gravelly sandy loam—on a SW facing slope of 7 percent at 300 feet (91 m) elevation under forest vegetation

Oi—1 inch to 0 (3 cm to 0); partially decomposed moss, roots, and leaves
E—0 to 3 inches (0 to 8 cm); gray (10YR 5/1) gravelly sandy loam; weak fine granular structure; very friable; nonsticky and nonplastic; common very fine, fine, and medium roots; 5 percent stones, 20 percent gravel; extremely acid (pH 4.2); abrupt smooth boundary
Bhs1—3 to 5 inches (8 to 13 cm); brown (7.5YR 4/4) very gravelly coarse sandy loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; common very fine, fine, and medium roots; 5 percent stones, 50 percent gravel; very strongly acid (pH 4.7); clear smooth boundary
Bhs2—5 to 11 inches (13 to 28 cm); reddish brown (5YR 4/4) very gravelly loamy coarse sand; weak fine subangular blocky structure; friable; nonsticky and nonplastic; 5 percent stones, 50 percent gravel; very strongly acid (pH 4.8); clear smooth boundary
C1—11 to 16 inches (28 to 41 cm); reddish brown (5YR 4/4) and strong brown (7.5YR 5/6) very gravelly loamy coarse sand; single grain; loose; nonsticky and nonplastic; 5 percent cobbles, 30 percent gravel; strongly acid (pH 5.2); clear smooth boundary
C2—16 to 24 inches (41 to 61 cm); dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6) very gravelly loamy coarse sand; massive; firm; nonsticky and nonplastic; 5 percent cobbles, 50 percent gravel; strongly acid (pH 5.4); gradual wavy boundary
C3—24 to 60 inches (61 to 152 cm); dark brown (7.5YR 4/2) and dark grayish brown (2.5Y 4/2) very gravelly loamy coarse sand; massive; firm; nonsticky and nonplastic; 5 percent cobbles, 50 percent gravel; strongly acid (pH 5.4)

Typical Pedon Location

Map unit in which located: 111—Krubate gravelly sandy loam, 5 to 20 percent slopes, extremely stony

Location in survey area: in the SW1/4, NW1/4 of sec. 2, T.59 E., R.31 S., Copper River Meridian

Range in Characteristics

Depth to sand and gravel: less than 10 inches (25 cm)
Reaction: extremely acid to slightly acid
Solum thickness: 7 to 18 inches (18 to 46 cm)
Organic layer thickness: 1 to 7 inches (3 to 18 cm)

A horizon:
Present in some pedons

E horizon:
Stone content—5 to 10 percent

Bhs and Bs horizons:
There is more than 6 percent organic carbon in the upper 4 inches of the spodic horizon.
Hue—10YR, 7.5YR, 5YR, or 2.5YR
Value—2 to 6 moist
Chroma—1 to 4 moist
Texture—coarse sandy loam, loamy coarse sand, coarse sand, loamy sand, or sand

C horizon:
Texture—loamy coarse sand, coarse sand, loamy sand, or sand

Krubate Variant

Taxonomic class: sandy-skeletal, mixed Sideric Cryaquods
Depth class: very deep—more than 60 inches (152 cm)
Drainage class: very poorly to poorly drained
Permeability: in the upper part—moderate; below this—rapid
Positions on landscape: outwash plains
Microtopography: low-lying areas and depressions
Parent material: very gravelly glaciofluvial deposits
Slope range: 0 to 20 percent
Elevation: 0 to 800 feet (0 to 244 m)
Climatic data (average annual):
*precipitation—55 to 65 inches (140 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Sample Pedon

Krubate Variant—on a S facing slope of 5 percent at 300 feet (91 m) elevation under forest vegetation
Oi—2 inches to 0 (5 cm to 0); partially decomposed moss and forest litter; clear smooth boundary
A—0 to 3 inches (0 to 8 cm); black (10YR 2.5/1) silt loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; very strongly acid (pH 4.6); clear smooth boundary
E—3 to 5 inches (8 to 13 cm); dark gray (10YR 4/1) silt loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; many fine, medium, and coarse roots; strongly acid (pH 5.4); clear smooth boundary
Bhs1—5 to 6 inches (13 to 15 cm); black (10YR 2.5/1) silt loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; common fine and medium roots; medium acid (pH 5.8); clear smooth boundary
2Bhs2—6 to 12 inches (15 to 30 cm); dark reddish brown (5YR 3/2) very gravelly coarse sandy loam; single grain; loose; nonsticky and nonplastic; few fine roots; 40 percent gravel; medium acid (pH 5.8); clear smooth boundary
3C1g—12 to 22 inches (30 to 56 cm); very dark grayish brown (10YR 3/2) extremely gravelly loamy coarse sand; few fine pockets of dark reddish brown (2.5YR 3/4) material; single grain; loose; nonsticky and nonplastic; 70 percent gravel, 5 percent cobbles; water table at 17 inches (43 cm) (6/82); medium acid (pH 5.8); gradual smooth boundary
3C2g—22 to 60 inches (56 to 152 cm); dark olive gray (5Y 3/2) extremely gravelly loamy coarse sand; single grain; loose; nonsticky and nonplastic; 70 percent gravel, 5 percent cobbles; medium acid (pH 5.8)

Sample Pedon Location

Map unit in which located: 114—Krubate Variant, 0 to 20 percent slopes
Location in survey area: in the SE 1/4 of sec. 2, T.31 S., R.59 E., Copper River Meridian

Range in Characteristics

Depth to sand and gravel: 7 to 20 inches (18 to 51 cm)
Reaction: extremely acid to medium acid

Kupreanof Series

Taxonomic class: loamy-skeletal, mixed Typic Humicryods

Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; below this—moderately rapid
Positions on landscape: moraines and mountainsides
Parent material: colluvium and glacial till
Slope range: 2 to 70 percent
Elevation: 0 to 3000 feet (0 to 914 m)
Climatic data (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Kupreanof silt loam—on a NE facing slope of 10 percent at 900 feet (274 m) elevation under forest vegetation

Oe—2 inches to 0 (5 cm to 0); moderately decomposed twigs, leaves and moss; clear wavy boundary
E—0 to 3 inches (0 to 8 cm); dark gray (10YR 4/1) silt loam; weak fine granular structure; friable; nonsticky and nonplastic; many fine, medium, and coarse roots; 5 percent gravel; extremely acid (pH 3.9); abrupt smooth boundary
Bhs1—3 to 8 inches (8 to 20 cm); dark reddish brown (5YR 3/3) gravelly sandy loam; weak fine granular structure; friable; nonsticky and nonplastic; many fine, medium and coarse roots; 20 percent gravel; extremely acid (pH 4.4); gradual irregular boundary
Bhs2—8 to 13 inches (20 to 33 cm); dark reddish brown (5YR 3/3) very gravelly coarse sandy loam; weak fine granular structure; friable; nonsticky and nonplastic; many very fine, fine, medium and coarse roots; 30 percent gravel, 5 percent cobbles; very strongly acid (pH 4.6); gradual wavy boundary
Bs—13 to 22 inches (33 to 56 cm); dark brown (7.5YR 3/4) very gravelly coarse sandy loam; weak fine granular structure; friable; nonsticky and nonplastic; common fine, medium, and coarse roots; 30 percent gravel, 10 percent cobbles; few pockets of very dark grayish brown (2.5YR 3/2) and dark yellowish brown (10YR 3/4) sandy loam; very strongly acid (pH 5.0); gradual wavy boundary
C—22 to 60 inches (56 to 152 cm); dark brown (7.5YR 3/2) very cobbly sandy loam; single grain; loose; nonsticky and nonplastic; few fine and medium roots; 25 percent gravel, 20 percent cobbles; strongly acid (pH 5.3)

Typical Pedon Location

Map unit in which located: 115—Kupreanof-Foad complex, 2 to 20 percent slopes
Location in survey area: in the SE1/4, NW1/4 of sec. 23, T.28 S., R.53 E., Copper River Meridian

Range in Characteristics

Reaction: extremely acid to strongly acid
Solum thickness: 9 to 45 inches (23 to 114 cm)
Organic layer thickness: 1 to 5 inches (3 to 13 cm)

A horizon:
Present in some pedons

Bhs and Bs horizons:
There is more than 6 percent organic carbon in the upper 4 inches of the spodic horizon.
Hue—10YR, 7.5YR, 5YR, or 2.5YR
Value—2 to 5 moist
Chroma—1 to 6 moist
Texture—loam, silt loam, coarse sandy loam, or sandy loam

C horizon:
Texture—loam, coarse sandy loam, or sandy loam

Taxadjunct Features

Map units—107, 130: On slopes greater than 70 percent, the spodic horizons are nondiscernible and are grading into cambic horizons. This is outside the range defined for the series, but this difference does not significantly affect the use or behavior of the soils.

Lithic Cryofolists

Taxonomic class: Lithic Cryofolists
Depth class: very shallow to shallow—2 to 20 inches (5 to 51 cm) over bedrock
Drainage class: well drained
Permeability: assumed to be rapid
Positions on landscape: mountainsides
Parent material: mostly fibric and hemic organic materials from sphagnum moss
Slope range: 20 to 120 percent
Elevation: 0 to 4000 feet (0 to 1219 m)
Climatic data (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—41 °F (5 °C)
*growing degree days—1500

Sample Pedon

Lithic Cryofolists—on an E facing slope of 42 percent at 225 feet (69 m) elevation under forest vegetation

Oi—0 to 7 inches (0 to 18 cm); very dark grayish brown (10YR 3/2) fibric material, very dark gray (10YR 3/1) when pressed; 90 percent fiber, 70 percent rubbed; mostly sphagnum moss; extremely acid (pH 3.8); abrupt smooth boundary
Oe—7 to 10 inches (18 to 25 cm); very dark gray (10YR 3/1) hemic material, black (10YR 2.5/1) when pressed; 60 percent fiber, 20 percent rubbed; mostly sphagnum moss; extremely acid (pH 4.0); abrupt smooth boundary
R—10 inches (25 cm); granite bedrock

Sample Pedon Location

Map unit in which located: 120—Lithic Haplocryods-Lithic Cryofolists-Rock outcrop complex, 40 to 70 percent slopes
Location in survey area: in the NW1/4, SE1/4 of sec. 27, T.29 S., R.59 E., Copper River Meridian

Range in Characteristics

Depth to bedrock: 2 to 20 inches (5 to 51 cm)
Texture: mostly fibric and hemic organic material from sphagnum moss, underlain in places with a thin layer of sapric material
These soils are saturated. During periods of high rainfall and snowmelt, water moves laterally across the bedrock and does not become stagnant.

Lithic Cryorthents

Taxonomic class: Lithic Cryorthents
Depth class: very shallow to shallow—2 to 20 inches (5 to 51 cm) over bedrock
Drainage class: well drained
Permeability: moderately rapid to rapid
Positions on landscape: mountainsides
Parent material: calcareous loess and colluvium from igneous and metamorphic rock
Slope range: 70 to 120 percent
Elevation: 0 to 4000 feet (0 to 1219 m)
Climatic data (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Sample Pedon

Lithic Cryorthents—on an E facing slope of 75 percent at 900 feet (274 m) elevation under forest vegetation

Oi—2 inches to 0 (5 cm to 0); partially decomposed moss and forest litter; clear smooth boundary
A—0 to 2 inches (0 to 5 cm); very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable; nonsticky and nonplastic; common fine and medium roots; slightly effervescent; mildly alkaline (pH 7.4); clear smooth boundary
C—2 to 6 inches (5 to 15 cm); yellowish brown (10YR 5/4) silt loam; massive; friable; nonsticky and nonplastic; common fine and medium roots; 10 percent gravel; slightly effervescent; mildly alkaline (pH 7.4); abrupt irregular boundary
R—6 inches (15 cm); metamorphic rock

Sample Pedon Location

Map unit in which located: 128—Rock Outcrop-Lithic Cryorthents complex, 70 to 120 percent slopes
Location in survey area: in the SW1/4 of sec. 5, T.30 S., R.58 E., Copper River Meridian

Range in Characteristics

Depth to bedrock: 2 to 20 inches (5 to 51 cm)
Texture: silt loam, very fine sandy loam, sandy loam
Rock fragment content: 0 to 50 percent
Effervescent: slightly to strongly
Reaction: neutral to mildly alkaline

Lithic Haplocryods

Taxonomic class: Lithic Haplocryods
Depth class: very shallow to shallow—2 to 20 inches (5 to 51 cm) over bedrock
Drainage class: well drained
Permeability: moderate to moderately rapid
Positions on landscape: mountainsides
Parent material: loess over colluvium from igneous and metamorphic rock
Slope range: 20 to 75 percent
Elevation: 0 to 3000 feet (0 to 914 m)
Climatic data (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Sample Pedon

Lithic Haplocryods—on an E facing slope of 45 percent at 500 feet (152 m) elevation under forest vegetation

Oi—2 inches to 0 (5 cm to 0); partially decomposed pine needles and moss; clear smooth boundary
E—0 to 1 inch (0 to 3 cm); gray (10YR 5/1) silt loam; weak fine granular structure; very friable; nonsticky and nonplastic; common fine and medium roots; strongly acid (pH 5.2); abrupt smooth boundary
Bs—1 to 3 inches (3 to 8 cm); dark brown (7.5YR 4/4) silt loam; weak fine granular structure; very friable; nonsticky and nonplastic; common fine and medium roots; strongly acid (pH 5.4); abrupt smooth boundary
R—3 inches (8 cm); granite bedrock

Sample Pedon Location

Map unit in which located: 120—Lithic Haplocryods-Lithic Cryofolists-Rock outcrop complex, 40 to 70 percent slopes.
Location in survey area: in the SW1/4 of sec. 7, T.26 S., R.56 E., Copper River Meridian

Range in Characteristics

Depth to bedrock: 2 to 20 inches (5 to 51 cm)
Texture: silt loam, fine sandy loam, very fine sandy loam, sandy loam, and loam
Rock fragment content: 0 to 50 percent (dominantly cobbles and stones)

Lutak Series

Taxonomic class: sandy-skeletal, mixed Typic Haplocryods
Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: in the upper part—moderate; in the 2C horizon—moderately rapid
Positions on landscape: stream terraces
Parent material: thin layer of eolian silt loam over glaciofluvial deposits
Slope range: 0 to 10 percent
Elevation: 50 to 1200 feet (15 to 366 m)
Climatic data (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Lutak silt loam—on a slightly NE facing slope of 4 percent at 200 feet (61 m) elevation under forest vegetation

Oi—6 to 2 inches (15 to 5 cm); slightly decomposed roots, leaves and moss; abrupt wavy boundary
Oe—2 inches to 0 (5 cm to 0); partially decomposed roots, leaves and moss; abrupt smooth boundary
E—0 to 3 inches (0 to 8 cm); grayish brown (10YR 5/2) silt loam; weak fine granular structure; very friable; nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; very strongly acid (pH 4.5); abrupt wavy boundary
Bs1—3 to 5 inches (8 to 13 cm); dark brown (7.5YR 4/4) sandy loam; weak fine granular structure; friable; nonsticky and nonplastic; common fine, medium and coarse roots; very strongly acid (pH 4.9); clear smooth boundary
2Bs2—5 to 8 inches (13 to 20 cm); dark reddish brown (5YR 3/4) loamy sand; weak fine granular structure; friable; nonsticky and nonplastic; common fine and medium roots; 10 percent gravel; strongly acid (pH 5.3); clear smooth boundary
3C1—8 to 14 inches (20 to 36 cm); dark brown (7.5YR 3/2) very gravelly loamy sand; weak fine granular structure; friable; nonsticky and nonplastic; few fine roots; 30 percent gravel, 5 percent cobbles; medium acid (pH 5.6); clear wavy boundary
3C2—14 to 72 inches (36 to 183 cm); dark brown (7.5YR 3/2) very gravelly loamy sand; massive; firm; nonsticky and nonplastic; 30 percent gravel, 10 percent cobbles; many olive stains; medium acid (pH 5.7)

Typical Pedon Location

Map unit in which located: 121—Lutak-Kupreanof association, 0 to 20 percent slopes
Location in survey area: in the NE1/4 of sec. 17, T.27 S., R.55 E., Copper River Meridian

Range in Characteristics

Depth to skeletal material: 7 to 12 inches (18 to 30 cm)
Reaction: very strongly acid to neutral
Solum thickness: 7 to 17 inches (18 to 43 cm)
Organic layer thickness: 1 to 6 inches (3 to 15 cm)

A horizon:
Present in some pedons

Bs and 2Bs horizons:
Hue—10YR, 7.5YR, 5YR, or 2.5YR
Value—2 to 5 moist
Chroma—2 to 4 moist
Texture—silt loam or sandy loam; in pedons where the solum extends into the skeletal material, the texture ranges to sand or loamy sand

3C horizon:
Hue—2.5Y, 10YR, or 7.5YR
Texture—sand or loamy sand

Nataga Series

Taxonomic class: sandy-skeletal, mixed Typic Cryorthents
Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat excessively drained
Permeability: in the surface layer—moderate; below this—rapid
Positions on landscape: alluvial fans and toe slopes
Parent material: very cobbly alluvium and colluvium
Slope range: 0 to 40 percent
Elevation: 0 to 1700 feet (0 to 518 m)
Climatic data (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Nataga gravelly sandy loam on a NE facing slope of 7 percent at 60 feet (18 m) elevation under forest vegetation

Oi—3 inches to 0 (8 cm to 0); mat of slightly decomposed leaves, roots, and moss; abrupt smooth boundary
A—0 to 1 inch (0 to 3 cm); very dark grayish brown (10YR 3/2) gravelly sandy loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; many fine, medium, and coarse roots; 20 percent gravel, 5 percent cobbles; strongly acid (pH 5.4); abrupt smooth boundary
C1—1 to 12 inches (3 to 30 cm); dark grayish brown (10YR 4/2) very cobbly loamy sand; single grain; loose; nonsticky and nonplastic; many fine, medium, and coarse roots; 35 percent gravel, 20 percent cobbles; neutral (pH 6.6); gradual smooth boundary
C2—12 to 60 inches (30 to 152 cm); dark grayish brown (10YR 4/2) extremely cobbly loamy sand; single grain; loose; nonsticky and nonplastic; common fine and medium roots decreasing to few fine roots with depth; 30 percent gravel, 35 percent cobbles; neutral (pH 6.8)

Typical Pedon Location

Map unit in which located: 122—Nataga-Cryorthents association, 0 to 20 percent slopes
Location in survey area: in the NW1/4, NE1/4 of sec. 13, T.59 E., R.32 S., Copper River Meridian

Range in Characteristics

Organic layer thickness: 1 to 5 inches (3 to 13 cm)
A horizon:
Reaction—strongly acid to slightly acid

C horizon:
Hue—5Y, 2.5Y, 10YR, or 7.5YR
Value—3 to 6 moist
Chroma—2 to 4 moist
Texture—loamy sand or sand
Coarse fragment content—35 to 70 percent
Gravel content—15 to 40 percent
Cobble content—15 to 40 percent
Effervescent—none to strongly
Reaction—slightly acid to neutral

Skagway Series

Taxonomic class: mixed Typic Cryopsamments
Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat poorly drained
Permeability: in the surface layer—moderate; below this—rapid
Positions on landscape: floodplains and outwash plains
Parent material: alluvium
Slope range: 0 to 5 percent
Elevation: 0 to 1000 feet (0 to 305 m)
Climatic data (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Skagway fine sandy loam—on a nearly level floodplain at 200 feet (61 m) elevation under forest vegetation

Oi—4 to 2 inches (10 to 5 cm); mat of mostly undecomposed leaves and moss
Oe—2 inches to 0 (5 cm to 0); mat of moderately decomposed leaves and moss
A—0 to 2 inches (0 to 5 cm); dark brown (10YR 3/3) fine sandy loam; weak fine subangular blocky structure; very friable; nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; slightly effervescent; mildly alkaline (pH 7.4); abrupt smooth boundary
C1—2 to 17 inches (5 to 43 cm); dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) loamy fine sand; single grain; loose; nonsticky and nonplastic; common fine, medium, and coarse roots; slightly effervescent; mildly alkaline (pH 7.4); clear smooth boundary
C2—17 to 60 inches (43 to 152 cm); dark grayish brown (10YR 4/2) loamy fine sand; single grain; loose; nonsticky and nonplastic; common fine and medium roots decreasing to few fine roots with depth; slightly effervescent; mildly alkaline (pH 7.4)

Typical Pedon Location

Map unit in which located: 110—Hollow and Skagway soils, 0 to 5 percent slopes
Location in survey area: in the NW1/4, SW1/4 of sec. 21, T.28 S., R.54 E., Copper River Meridian

Range in Characteristics

Reaction: slightly acid to moderately alkaline
Organic layer thickness: 1 to 5 inches (3 to 13 cm)

A horizon:
Absent in some pedons

C horizon:
Hue—5Y, 2.5Y, or 10YR
Value—3 to 5 moist
Chroma—2 to 4 moist
Texture—loamy fine sand or sand; thin lenses of silt occur in some profiles
Coarse fragment content—0 to 20 percent
Gravel content—0 to 20 percent
Cobble content—0 to 5 percent
Effervescent—slightly to strongly

Tolstoi Series

Taxonomic class: loamy-skeletal, mixed Lithic humicryods
Depth class: shallow—14 to 20 inches (36 to 51 cm) over bedrock
Drainage class: well drained
Permeability: in the upper part—moderate; below this—moderately rapid
Position on landscape: mountainsides
Parent material: residuum and colluvium from metamorphic rock
Slope range: 10 to 70 percent
Elevation: 0 to 3000 feet (0 to 914 m)
Climatic data (average annual):
*precipitation—21 to 120 inches (53 to 305 cm)
*air temperature— 41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Tolstoi silt loam—on an E facing slope of 30 percent at 400 feet (122 m) elevation under forest vegetation

Oe—5 inches to 0 (13 cm to 0); partially decomposed twigs, leaves, and moss; clear smooth boundary
E—0 to 2 inches (0 to 5 cm); dark gray (10YR 4/1) silt loam; weak fine granular structure; very friable; nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; very strongly acid (pH 4.5); abrupt wavy boundary
Bhs1—2 to 6 inches (5 to 15 cm); dark brown (7.5YR 3/2) gravelly silt loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; many fine, medium, and coarse roots; 25 percent gravel, 5 percent cobbles; strongly acid (pH 5.4); gradual smooth boundary
Bhs2—6 to 11 inches (15 to 28 cm); dark brown (7.5YR 3/2) very gravelly silt loam; weak fine subangular blocky structure; friable; fine, medium, and coarse roots; 30 percent gravel, 10 percent cobbles; strongly acid (pH 5.4); gradual smooth boundary
Bhs3—11 to 19 inches (28 to 48 cm); dark brown (7.5YR 3/2) very cobbly silt loam; weak fine subangular blocky structure; friable; nonsticky and nonplastic; few fine and medium roots; 25 percent gravel, 20 percent cobbles; strongly acid (pH 5.5); abrupt wavy boundary
R—19 inches (48 cm); schist bedrock

Typical Pedon Location

Map unit in which located: 135—Tolstoi-Foad complex, 20 to 40 percent slopes
Location in survey area: in the NW1/4 of sec. 22, T.28 S., R.55 E., Copper River Meridian

Range in Characteristics

Depth to bedrock: 14 to 20 inches (36 to 51 cm)
Reaction: extremely acid to medium acid
Solum thickness: 7 to 20 inches (18 to 51 cm)
Organic layer thickness: 1 to 5 inches (3 to 13 cm)

A horizon:
Present in some pedons

Bhs horizon:
There is more than 6 percent organic carbon in the upper 4 inches of the spodic horizon.
Hue—10YR, 7.5YR, 5YR, or 2.5YR
Value—2 to 5 moist
Chroma—1 to 4 moist
Texture—silt loam, sandy loam, or fine sandy loam

C horizon:
Present in some pedons

Taxadjunct Features

Map units—129, 130, 140: On slopes greater than 70 percent, the spodic horizons are nondiscernible and are grading into cambic horizons. This is outside the range defined for the series, but this difference does not significantly affect the use or behavior of the soils.

Tsirku Series

Taxonomic class: coarse-loamy, mixed (calcareous) Typic Cryofluvents
Depth class: very deep—more than 60 inches (152 cm)
Drainage class: somewhat poorly drained
Permeability: in the upper part—moderate; in the 2C horizon—rapid
Positions on landscape: floodplains and outwash plains
Parent material: alluvium
Slope range: 0 to 5 percent
Elevation: 0 to 1000 feet (0 to 305 m)
Climatic data (average annual):
*precipitation—21 to 65 inches (53 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Typical Pedon

Tsirku silt loam—on a nearly level floodplain at 200 feet (61 m) elevation under forest vegetation

Oi—1 inch to 0 (3 cm to 0); mat of slightly decomposed leaves and roots; abrupt smooth boundary
A—0 to 1 inch (0 to 3 cm); dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; nonsticky and nonplastic; many fine, medium, and coarse roots; slightly effervescent; mildly alkaline (pH 7.6); abrupt smooth boundary
C1—1 to 41 inches (3 to 104 cm); dark grayish brown (2.5Y 4/2) silt stratified with thin lenses of dark grayish brown (10YR 4/2) fine sand and very dark gray (10YR 3/1) silt loam; massive; friable; nonsticky and nonplastic; many fine, medium, and coarse roots decreasing to few fine roots with depth; slightly effervescent; mildly alkaline (pH 7.6); abrupt smooth boundary
2C—41 to 60 inches (104 to 152 cm); olive gray (5Y 4/2) extremely gravelly sand; single grain; loose; 50 percent gravel, 20 percent cobbles; strongly effervescent; moderately alkaline (pH 8.4)

Typical Pedon Location

Map unit in which located: 142—Tsirku-Hollow-Funter complex, 0 to 5 percent slopes
Location in survey area: in the NE1/4, SW1/4 of sec. 22, T.28 S., R.54 E., Copper River Meridian

Range in Characteristics

Effervescent: none to strongly
Reaction: slightly acid to moderately alkaline
Organic layer thickness: 1 to 3 inches (3 to 8 cm)

A horizon:
Absent in some pedons

C1 horizon:
Hue—5Y, 2.5Y, 10YR, or 7.5YR
Value—3 to 5 moist
Chroma—1 to 4 moist
Texture—silt stratified with silt loam and fine sand
Coarse fragment content—0 to 20 percent
Gravel content—0 to 20 percent
Cobble content—0 to 5 percent

2C horizon:
Texture—sand or loamy sand
Coarse fragment content—35 to 70 percent
Gravel content—20 to 60 percent
Cobble content—0 to 30 percent

Typic Cryaquods

Taxonomic class: Typic Cryaquods
Depth class: very deep—more than 60 inches (152 cm)

Drainage class: poorly drained
Permeability: in the upper part— moderate to moderately rapid; in the 2C horizon—slow
Positions on landscape: outwash plains
Microtopography: low-lying areas and depressions
Parent material: gravelly glaciofluvial deposits underlain by fine marine sediments
Slope range: 0 to 20 percent
Elevation: 0 to 800 feet (0 to 244 m)
Climatic data (average annual):
*precipitation—55 to 65 inches (140 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Sample Pedon

Typic Cryaquods—on a SW facing slope of 4 percent at 80 feet (24 m) elevation under forest vegetation

Oe—2 inches to 0 (5 cm to 0); partially decomposed mat of forest litter and moss
E—0 to 3 inches (0 to 8 cm); gray (5Y 5/1) silt loam; weak fine granular structure; very friable; nonsticky and nonplastic; many fine and medium roots; very strongly acid (pH 4.8); abrupt wavy boundary
Bs1—3 to 6 inches (8 to 15 cm); dark reddish brown (2.5YR 3/4) gravelly silt loam; weak fine granular structure; very friable; nonsticky and nonplastic; common fine and medium roots; 15 percent gravel; very strongly acid (pH 5.0); clear wavy boundary
Bs2—6 to 10 inches (15 to 25 cm); yellowish red (5YR 4/6) gravelly sandy loam; weak fine granular structure; very friable; nonsticky and nonplastic; common fine roots; 25 percent gravel; very strongly acid (pH 4.7); abrupt wavy boundary
Cg—10 to 23 inches (25 to 58 cm); olive brown (2.5Y 4/4) gravelly sandy loam; many prominent mottles of dark reddish brown; weak thin platy structure; firm; nonsticky and nonplastic; few fine roots; 30 percent gravel; weakly cemented; very strongly acid (pH 4.7); abrupt wavy boundary
2Cg—23 to 60 inches (58 to 152 cm); olive gray (5Y 5/2) silty clay loam; common distinct mottles of dark yellowish brown and strong brown; weak thin platy structure; firm; sticky and plastic; very strongly acid (pH 4.7)

Sample Pedon Location

Map unit in which located: 143—Typic Cryaquods, 0 to 20 percent slopes
Location in survey area: in the SW 1/4 of sec. 27, T.30 S., R.59 E., Copper River Meridian

Range in Characteristics

Depth to bedrock: more than 60 inches (152 cm)
Depth to clayey substratum: 10 to 30 inches (25 to 76 cm)
Reaction: extremely acid to slightly acid

Solum:
Texture—silt loam, sandy loam, coarse sandy loam
Gravel content—0 to 50 percent
Stone content—0 to 15 percent
Cobble content—0 to 20 percent
2C horizon:
Texture—silty clay loam, silty clay, clay loam

Typic Haplocryods

Taxonomic class: Typic Haplocryods
Depth class: very deep—more than 60 inches (152 cm)
Drainage class: well drained
Permeability: moderately slow to moderately rapid
Positions on landscape: outwash plains
Parent material: glaciofluvial deposits
Slope range: 0 to 40 percent
Elevation: 0 to 800 feet (0 to 244 m)
Climatic data (average annual):
*precipitation—55 to 65 inches (140 to 165 cm)
*air temperature—41 °F (5 °C)
*growing degree days—more than 1500

Sample Pedon

Typic Haplocryods—on a W facing slope of 15 percent at 200 feet (61 m) elevation under forest vegetation

Oe—2 inches to 0 (5 cm to 0); partially decomposed mat of forest litter and moss; abrupt smooth boundary
E—0 to 2 inches (0 to 5 cm); grayish brown (10YR 5/2) silt loam; weak fine subangular blocky structure; very friable; nonsticky and nonplastic; many very fine, fine, and medium roots; very strongly acid (pH 4.8); abrupt smooth boundary
Bs1—2 to 3 inches (5 to 8 cm); dark brown (7.5YR 3/4) silt loam; weak fine subangular blocky structure; very friable; nonsticky and nonplastic; common very fine, fine, and medium roots; strongly acid (pH 5.2); clear smooth boundary
Bs2—3 to 5 inches (8 to 13 cm); dark yellowish brown (10YR 3/4) silt loam; weak fine subangular blocky structure; very friable; nonsticky and nonplastic; common very fine, fine, and medium

roots; strongly acid (pH 5.2); clear smooth boundary

C1—5 to 22 inches (13 to 56 cm); olive brown (2.5Y 4/4) silt loam; massive; friable; nonsticky and nonplastic; few fine roots; strongly acid (pH 5.4); gradual smooth boundary

C2—22 to 60 inches (56 to 152 cm); grayish brown (2.5y 5/2) silt loam; massive; friable; nonsticky and nonplastic; strongly acid (pH 5.4)

Sample Pedon Location

Map unit in which located: 146—Typic Haplocryods-Histic Cryaquepts complex, 5 to 20 percent slopes

Location in survey area: in the NW1/4 of sec. 30, T.31 S., R.60 E., Copper River Meridian

Range in Characteristics

Texture: silt loam, loam, fine sandy loam, or sandy loam

Rock fragment content: 0 to 60 percent; stone content—0 to 35 percent

Reaction: ultra acid to slightly acid

Formation of the Soils

Factors of Soil Formation

The interrelated factors that determine soil formation at a particular location include the climate, the biological organisms in the soil system, the topography of the area, the composition of the parent material, and the length of time that these factors have acted together. The magnitude of the effect of any individual factor varies from soil to soil.

The processes of soil formation are quite complex. There are many variances in climate, and many kinds and combinations of biological forces. Parent materials vary widely in physical, chemical, and mineralogical properties, and there are great differences in the length of time that the other factors have been acting upon the parent material. The activities of man have had little effect on these factors in the Haines Area.

The history of the development of soil characteristics is called soil genesis. Collectively, the characteristics themselves are called soil morphology. Although much is known about soil genesis, it is not possible to reconstruct the precise history of a soil's development from the data available. Consequently, the system of soil classification used in the United States is based on morphologic features. It is possible to select morphologic features of soils known to result from given processes of soil genesis and, guided by an understanding of soil genesis, to use these features as the basis of a usable form of soil classification.

The following sections evaluate the five soil forming factors and show how they have influenced the development or morphology of the soils of the Haines Area. How the resulting morphology has been used to group the soils into the units of the classification system is also discussed.

Climate

The climate of the area is predominantly cool maritime. Mean annual precipitation ranges from 21 to 65 inches (53 to 165 cm) at the lower elevations. This diversity is due to the rugged terrain and varying distances from the coast. Precipitation is estimated to exceed several hundred inches for the higher elevations. Climatic data are discussed in detail in "General Nature of the Survey Area" (page 1).

Climate influences the kind and amount of vegetation and the rate of chemical weathering, which in turn influences soil development. Due to the large number of cloudy days and prolonged cold rains, the soils seldom dry out and, therefore, never reach the wilting point (*Gass et al. 1966*). The evapotranspiration rate is also low, resulting in more water being available for leaching and other soil forming processes.

The amount and distribution of precipitation in the area places most of the soils in the udic moisture regime (*Soil Survey Staff 1975*). Soils on the poorly drained and very poorly drained floodplains place in the aquic moisture regime (*Soil Survey Staff 1975*) due to high ground water levels which keep the soil saturated for prolonged periods. The Chilkoot and Ashmun series are two such poorly drained soils in the region.

The cool average annual temperature places all of the soils in the cryic temperature regime (*Soil Survey Staff 1975*). Cool temperatures, combined with cloudy days and prolonged periods of rain, result in slow plant decomposition, especially the decay of moss. Consequently, soils in the survey area have a high organic matter content. Typic Humicryods, such as the Foad and Kupreanof series, exhibit this property.

Biological Organisms

Biological organisms, consisting of plants and animals, have played a significant role in the development of soils in the area. The cool climate retards microbial activity; therefore, organic matter does not decompose rapidly and accumulates on the surface. Most of the soils have an organic mat consisting of sphagnum moss which provides a cover, reduces erosion, and stabilizes the soil surface.

Most of the soils on the uplands developed under a dense coniferous forest consisting primarily of Sitka spruce and western hemlock. This vegetation, together with the climate, is ideal for the development of Spodosols. Large amounts of humus and iron are leached downward and accumulate to form spodic horizons. Typic Humicryods, such as the Foad and Tolstoi soils, are examples of this process.

At an elevation between 2500 to 3000 feet (762 to 914 m), the plant community changes to a transition zone between the Sitka spruce/western hemlock below, and the alpine tundra above. Soils of the Tolstoi, Foad, and Kupreanof series gradually grade into the Ferebee soils that lack any spodic development. Throughout this alpine zone, rock outcrop and snowfields occur, precipitation is estimated to range from 60 to 120 inches (152 to 305 cm), and Sitka alder appears extensively.

At elevations above 3000 feet (914 m), precipitation is estimated to exceed several hundred inches. Ericaceous mat tundra occupies this area and is a contributing factor in the development of a discontinuous umbric epipedon; Ferebee soils are common.

Topography

Steep, dissected mountain slopes that rise abruptly from the nearly level river valleys characterize the Haines Area. U-shaped glaciated valleys dominate the area, with an array of alluvial fans and V-notch drainages. Swift flowing rivers and streams occur throughout.

Topography is an important soil-forming factor. Soils on mountains and moraines exhibit the mixing and churning of horizons in many profiles due to windthrow and soil creep. These factors also effect the thickness of the soil. Tolstoi-Foad complex, 70 to 100 percent slopes, is one map unit that displays these properties.

Windthrow and soil creep also result in numerous depressions scattered throughout the landscape. Very poorly drained and poorly drained soils, such as Histic Cryaquepts, occur in these depressions.

Aspect has little effect on soil development in the Haines Area due to the numerous cloudy days, prolonged periods of cold rain, and cool temperatures.

In the survey area, steepness of slope, total annual precipitation, soil temperature regime, and vegetation are all related to the leaching system. Foad, Kupreanof, and Tolstoi soils in map units with slopes greater than 70 percent are taxadjuncts to their respective series. Spodic horizons are either not observable or intergrade to cambic horizons. In other areas of Southeast Alaska where there are similar slopes but higher precipitation, the leaching process apparently intensifies, as spodic horizons do occur on slopes in excess of 70 percent.

Parent Material

Soils of the Ashmun, Hollow, Skagway, and Tsirku series formed in alluvium consisting of mostly calcareous sands and gravel. They occur along the floodplains of the Chilkat and Klehini Rivers. These soils have poorly expressed morphological features and are distinguished mainly by differences in the texture of their control section. Drainage of these soils ranges from the somewhat poorly drained Hollow, Skagway, and Tsirku soils to the very poorly drained Ashmun soils.

Soils of the Chilkoot series formed in alluvium consisting of slightly acid sands. They occur along floodplains of the Ferebee and Chilkoot Rivers, and drainage ranges from very poorly to poorly drained. The water table is lower in some areas due to altered drainage resulting from stream incisement.

Funter soils occur within muskegs on the floodplains and terraces. They formed in fibrous peat underlain by loamy materials at various depths. Drainage is very poor, with a water table at or near the surface.

Lutak soils formed in a thin layer of eolian silt loam over glaciofluvial sediments. They occur on stream terraces. Morphology of the Lutak soil supports a spodic horizon, although lab data do not.

The parent material of soils that formed on alluvial and colluvial fans consists of very cobbly and extremely cobbly sands and varies greatly in age. Nataga soils formed in this material.

Soils on mountainsides and moraines formed in residuum, colluvium, loess, and organic deposits. Kupreanof soils, which occur on moraines, formed in colluvium from glacial till. Soils of the Foad and Tolstoi series formed in residuum and colluvium derived dominantly from metamorphic rocks on mountainsides. Lithic Cryorthents, on mountains northwest of Haines, formed in calcareous loess from floodplains, together with colluvium from igneous and metamorphic rocks. Depth to bedrock is variable. Lithic Cryofolists, located in the north and northwest part of the survey area, formed in fibric and hemic organic materials from sphagnum moss overlying bedrock at varying depths.

Soils that occur on the Chilkat Peninsula are unique when compared to other soils in the survey area. It is estimated that the Peninsula has been uplifted 300 to 600 feet (91 to 183 m) during the last

10,000 years, and continues to be uplifted at the rate of 2.26 centimeters per year (*Lemke and Yehle 1972*). Krubate soils, found only on the Peninsula, formed in very gravelly glaciofluvial deposits when the lower areas were submerged and became part of Chilkoot Inlet. Typic Cryaquods also formed in similar glaciofluvial deposits, but are underlain by fine marine sediments.

The Ferebee soils, which occur on mountaintops throughout the area, formed in residuum and colluvium from metamorphic rocks.

Rock outcroppings and glaciers are common in the area.

Time

Soils in the area are estimated to be approximately 10,000 years old, and are considered relatively young with little variation in age. Glaciers covered the area several times during the Pleistocene Epoch (*Lemke and Yehle 1972*).

Although the soils are young when compared with those in the continental United States, many exhibit well expressed horizons. Grayish E horizons and reddish Bs horizons show the effects of eluviation and illuviation of organic matter, iron, and aluminum, and are readily observed on mountain soils. These distinct horizons are exhibited in Kupreanof and Foad soils.

In contrast, soils along streams show little development. They continue to receive fresh deposits and are the most youthful soils in the area. Mineral soils on floodplains have had little time to accumulate organic matter. They exhibit weakly developed A and C horizons. Examples of these soils are the Hollow and Tsirku series.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hill slopes.

Alluvium. Material, such as sand, silt, or clay deposited on land by streams.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Avalanche chutes. Localized areas on mountainsides that are subject to frequent, downward mass movements of snow, ice, soil, and rock fragments.

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Blowdown. Trees that are tipped over or uprooted by high winds.

Board-feet (woodland). A unit of measure for standing or felled trees and logs where one unit equals the volume of a 1-foot by 1-foot by 1-inch board.

Bottom land. The normal floodplain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (61 cm) in diameter.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation, and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing

facility. Most systems involve a drum, pole, and wire cables using the same principle as that of a rod and reel for fishing. Generally, felled trees are yarded, or reeled in, with one end lifted or the log completely suspended to reduce friction and soil disturbance.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Cants. A log squared on two or more sides.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clearcutting. A method of forest cutting that removes the entire stand of trees in the area cut.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25.4 cm) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25.4 cm) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forest land capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Compaction (woodland). The process by which soil void space is decreased from the downward force applied by the use of various logging equipment during moist or wet soil conditions. Soil structure is not significantly changed.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern, or so small in area, that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose—Noncoherent when dry or moist; does not hold together in a mass.

Friable—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft—When dry, breaks into powder or individual grains under very slight pressure.

Cemented—Hard; little affected by moistening.

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a

few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Conventional wheeled and tracked equipment (woodland). Mechanized logging equipment such as rubber-tired skidders, hydraulic loaders, feller-bunchers, and crawler tractors.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cubic feet (woodland). A unit of measure for standing or felled trees and logs where one unit equals the volume of a 1-foot by 1-foot by 1-foot cube.

Culmination of the mean annual increment (CMAI). The average yearly volume growth of a stand of trees from the year of origin to that age which gives the highest average. The CMAI for a particular species is based on the applicable yield table publication, and uses those volumes given for the smallest size. All publications pertain only to naturally established, even-aged, unmanaged stands.

Culverts. A pipe, made of steel or other durable material, that is installed beneath a road and used to convey water from one side to the other.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Depth, soil. Generally, the thickness of soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 20 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Displacement (woodland). The process by which soil material of the surface and subsurface layers is pushed from its natural position by the use of various logging equipment.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage which is commonly the result of artificial drainage or irrigation, but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained—These soils are wet close enough to the surface, or long enough, that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained—These soils are wet close enough to the surface, or long enough, that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground, at a lower elevation than the surrounding ground, in which water collects and is drained to a closed depression or lake, or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Dune. A mound, ridge, or hill of loose, windblown, granular material (generally sand), either bare or covered with vegetation.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic)—Erosion caused by geologic processes acting over long geologic periods, and resulting in the wearing away of mountains and the building up of such landscape features as floodplains and coastal plains. Synonym: natural erosion.

Erosion (accelerated)—Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Even-aged, unmanaged stands (woodland). A natural stand of trees having little difference in total age. By convention, the maximum difference is 10 to 20 years.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreaks. A natural or constructed barrier used to prevent or retard the spread of a fire.

Floodplain. A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the stream.

Foot slope. The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface profile is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Giant ripple mark. The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the floodplain.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 mm to 7.6 cm) in diameter. An individual piece is a pebble.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type (woodland). A plant community having a more or less unique composition of species that identifies a particular combination of climatic and edaphic factors.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers, or lowercase letters that follow, represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:
O horizon—An organic layer of fresh and decaying plant residue.
A horizon—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
B horizon—The mineral horizon below an A horizon. The B horizon is, in part, a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.
E horizon—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.
C horizon—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the number 2 precedes the letter C.
Cr horizon—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.
R layer—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet, and a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Lake plain. A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.

Landings (woodland). A cleared area within a harvest unit where logs from cut trees are collected and stacked to ready them for further transport to a processing facility.

Large stones (in tables). Rock fragments 3 inches (7.6 cm) or more across. Large stones adversely affect the specified use of the soil.

Lateral moraine. A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived

from the valley walls by glacial abrasion and plucking or by mass wasting.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Low strength. The soil is not strong enough to support loads.

Mean annual increment (MAI). The average annual increase in volume of a tree during the entire life of the tree.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minor components. A component of limited extent that may not be present.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine. An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface rising more than 1,000 feet above surrounding lowlands, commonly of limited summit area, and generally having steep sides (slopes greater than 25 percent) and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by deep-seated earth movements or volcanic action and secondarily by differential erosion.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natural regeneration (woodland). Tree seedlings that repopulate or reforest a site by seed from nearby parent trees.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash, plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large

enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	Less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	More than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management; for example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Precommercial thinning. Selectively removing a portion of trees on a site to improve the growth of the well-distributed remaining trees. Trees that are cut too small to be salable or merchantable.

Principal tree species. Tree species that were found during sampling to occupy at least 10 percent of the total acreage of a particular soil map unit.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Puddling (woodland). The process by which soil void space is decreased, and soil structure significantly altered or deformed, from the downward force applied by the use of various logging equipment during wet soil conditions.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	Below 3.5
Extremely acid	3.5 to 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Reforestation. Tree seedlings that are planted or become naturally established from seed disseminated by nearby cone-bearing trees on an area of land that was once forested; also includes the physical actions associated with planting tree seedlings in the ground. The expected period of time it takes for an area to naturally reforest is described by the terms “readily,” seedlings expected to occupy the area in two to five years, and “periodically,” seedlings occupy the area in five to ten years.

Regeneration. The new growth of a natural plant community developing from seed.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut slopes (woodland). A sloping surface cut into a hillside produced by mechanical means during road construction; usually on the uphill side of the road.

Road fill slopes (woodland). A sloping surface produced from excavated soil material from the road cut slope; usually on the downhill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Rubbleland. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive, nearly level to gently rolling, or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the floodplain.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder slope. The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry, and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than

12 percent clay.

Silvicultural. Relating to silviculture; silviculture being the management or cultivation of forest trees.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph which shows the average height of dominant and codominant trees for a range of ages on ground with differing productivity levels. Each level is represented by a curve. The basis of the curves are the height of dominant and codominant trees that are 50 years of age.

Site curve (100-year). A set of related curves on a graph which shows the average heights of dominant and codominant trees for a range of ages on ground with differing productivity levels. Each level is represented by a curve. The basis of the curves are the height of dominant and codominant trees that are 100 years of age.

Site index (woodland). A numerical index equal to the height that dominant or dominant and codominant trees reach at a specific age, usually 50 or 100 years. Using this index and the age of the stand of trees, yield can be determined using the appropriate yield table publication.

Skid trails. The paths left from logs and the wheeled or tracked equipment used to pull them.

Skidder. A wheeled or tracked piece of equipment capable of pulling logs from the site of the felled tree to the landing.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 cm) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants, and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	Less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stocking (woodland). The degree to which an area is effectively covered with living trees. Fully stocked stands contain at least as many trees per acre as can properly use the growing space available.

Stones. Rock fragments 10 to 24 inches (25 to 61 cm) in diameter if rounded, or 6 to 15 inches (15 to 38 cm) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow, the deepest or central part of the bed formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned floodplain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Structure, soil. The arrangement of primary soil

particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 cm). Frequently designated as the "plow layer" or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble, and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Toe slope. The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Varient, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth shallow ditches or depressions that are excavated to a 45 degree angle across a sloping road. They are used to divert water off and away from the road surface.

Weathering. All physical and chemical changes produced in rocks or other deposits, at or near the earth's surface, by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

Yield (woodland). The volume of wood fiber from harvested trees taken from an area. Yield is measured in board-feet or cubic-feet per acre.

Tables

TABLE 1--TEMPERATURE & PRECIPITATION

(Recorded in the period 1973-1995 at Haines, AK)

Month	Temperature (Degrees F.)						Precipitation (Inches)				
	avg daily max	avg daily min	avg	2 yrs in 10 will have max temp. >than	2 yrs in 10 will have min temp. <than	avg # of grow deg days*	avg	2 yrs in 10 will have less than	2 yrs in 10 will have more than	avg # of days w/.1 or more	avg total snow fall
January	30.6	20.2	25.4	47	-7	1	5.77	3.12	8.10	11	29.6
February	33.4	22.1	27.8	49	-5	3	4.73	2.75	6.94	10	28.9
March	40.2	28.1	34.2	53	6	6	3.07	1.22	4.62	7	8.4
April	49.3	34.4	41.9	69	21	88	2.76	0.81	4.33	5	2.2
May	57.9	42.0	50.0	77	31	294	1.57	0.66	2.35	4	0.1
June	64.3	48.3	56.3	85	38	485	1.46	0.63	2.16	4	0.0
July	66.5	50.8	58.6	87	43	566	1.40	0.69	2.01	4	0.0
August	65.6	48.9	57.3	88	39	528	2.26	0.69	3.53	5	0.0
September	58.1	43.6	50.9	74	30	317	5.22	2.86	7.31	9	0.2
October	47.5	36.9	42.2	58	17	103	9.33	5.89	12.43	14	2.3
November	35.6	25.3	30.4	48	3	6	6.18	3.10	8.87	12	22.5
December	31.3	21.7	26.5	45	-4	2	5.28	2.89	7.39	11	28.5
Yearly :											
Average	48.4	35.2	41.8	---	---	---	----	----	----	---	---
Extreme	98	-15	---	91	-10	---	----	----	----	---	---
Total	---	---	---	---	---	2398	49.03	35.45	55.41	96	122.7

Average # of days per year with at least 1 inch of snow on the ground: 93

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold: 40.0 °F).

TABLE 2--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1973-1995 at Haines, AK)

Probability	Temperature		
	24F or lower	28F or lower	32F or lower
Last freezing temperature in spring:			
1 year in 10 later than---	April 18	April 29	May 17
2 years in 10 later than--	April 10	April 23	May 11
5 years in 10 later than--	March 28	April 11	April 28
First freezing temperature in fall:			
1 yr in 10 earlier than---	October 10	September 29	September 19
2 yrs in 10 earlier than--	October 18	October 6	September 25
5 yrs in 10 earlier than--	November 4	October 20	October 6

TABLE 3--GROWING SEASON

(Recorded in the period 1973-1995 at Haines, AK)

Probability	Daily Minimum Temperature		
	# days > 24F	# days > 28F	# days > 32F
9 years in 10	179	163	132
8 years in 10	192	172	143
5 years in 10	217	189	164
2 years in 10	242	207	185
1 year in 10	255	216	196

TABLE 4--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
101	Ashmun-Funter association, 0 to 5 percent slopes	2,041	0.6
102	Ashmun-Hollow-Funter complex, 0 to 5 percent slopes	5,720	1.7
103	Beaches	1,197	0.4
104	Chilkoot-Chilkoot, moderately wet, association, 0 to 5 percent slopes	3,124	0.9
105	Cryorthents, 20 to 180 percent slopes	20,092	6.0
106	Ferebee-Rock outcrop complex, 5 to 90 percent slopes	31,567	9.4
107	Foad-Kupreanof complex, 70 to 100 percent slopes	2,535	0.8
108	Funter peat, 0 to 5 percent slopes	6,118	1.8
109	Histic Cryaquepts, 0 to 20 percent slopes	2,300	0.7
110	Hollow and Skagway soils, 0 to 5 percent slopes	11,952	3.6
111	Krubate gravelly sandy loam, 5 to 20 percent slopes, extremely stony	1,092	0.3
112	Krubate gravelly sandy loam, 20 to 40 percent slopes, extremely stony	139	*
113	Krubate gravelly sandy loam, 40 to 70 percent slopes, extremely stony	296	0.1
114	Krubate Variant, 0 to 20 percent slopes	391	0.1
115	Kupreanof-Foad complex, 2 to 20 percent slopes	6,737	2.0
116	Kupreanof-Foad complex, 20 to 40 percent slopes	15,561	4.7
117	Kupreanof-Foad complex, 40 to 70 percent slopes	14,358	4.3
118	Lithic Cryofolists-Rock outcrop-Lithic Haplocryods complex, 70 to 120 percent slopes	1,402	0.4
119	Lithic Haplocryods-Lithic Cryofolists-Rock outcrop complex, 20 to 40 percent slopes	963	0.3
120	Lithic Haplocryods-Lithic Cryofolists-Rock outcrop complex, 40 to 70 percent slopes	3,706	1.1
121	Lutak-Kupreanof association, 0 to 20 percent slopes	4,790	1.4
122	Nataga-Cryorthents association, 0 to 20 percent slopes	5,906	1.8
123	Nataga-Cryorthents association, 20 to 40 percent slopes	4,202	1.3
124	Riverwash	3,554	1.1
125	Rock outcrop-Lithic Cryofolists complex, 20 to 40 percent slopes	745	0.2
126	Rock outcrop-Lithic Cryofolists complex, 40 to 70 percent slopes	5,231	1.6
127	Rock outcrop-Lithic Cryofolists complex, 70 to 120 percent slopes	8,356	2.5
128	Rock outcrop-Lithic Cryorthents complex, 70 to 120 percent slopes	4,051	1.2
129	Rock outcrop-Tolstoi complex, 70 to 100 percent slopes	8,109	2.4
130	Rock outcrop-Tolstoi-Foad complex, 70 to 100 percent slopes	6,463	1.9
131	Rock outcrop and glaciers	76,523	22.9
132	Rubbleland	984	0.3
133	Skagway-Funter association, 0 to 5 percent slopes	3,346	1.0
134	Tolstoi-Foad complex, 5 to 20 percent slopes	886	0.3
135	Tolstoi-Foad complex, 20 to 40 percent slopes	3,412	1.0
136	Tolstoi-Foad complex, 40 to 70 percent slopes	10,717	3.2
137	Tolstoi-Rock outcrop complex, 10 to 20 percent slopes	58	*
138	Tolstoi-Rock outcrop complex, 20 to 40 percent slopes	419	0.1
139	Tolstoi-Rock outcrop complex, 40 to 70 percent slopes	5,394	1.6
140	Tolstoi-Foad complex, 70 to 100 percent slopes	15,632	4.7
141	Tolstoi, Foad, and Kupreanof silt loams, 20 to 70 percent slopes	12,950	3.9
142	Tsirku-Hollow-Funter complex, 0 to 5 percent slopes	1,263	0.4
143	Typic Cryaquods, 0 to 20 percent slopes	317	0.1
144	Typic Haplocryods, 5 to 20 percent slopes	1,408	0.4
145	Typic Haplocryods, 20 to 40 percent slopes	463	0.1
146	Typic Haplocryods-Histic Cryaquepts complex, 5 to 20 percent slopes	850	0.3
W	Water	17,205	5.1
	Total	334,525	100.0

* Less than 0.1 percent.

TABLE 5--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available.)

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
101**:										
Ashmun-------	2W	Slight	Moderate	Severe	Severe	Moderate	Black cottonwood	77	--	Black cottonwood.
Funter.										
102**:										
Ashmun--------	2W	Slight	Moderate	Severe	Severe	Moderate	Black cottonwood	77	--	Black cottonwood.
Hollow--------	2W	Slight	Moderate	Severe	Moderate	Moderate	Black cottonwood	73	--	Black cottonwood.
Funter.										
104**:										
Chilkoot.										
Chilkoot------	7W	Slight	Moderate	Severe	Severe	Moderate	Sitka spruce----	90	7	Sitka spruce
							black cottonwood-	---	--	black cottonwood,
							western hemlock--	---	--	western hemlock.
107**:										
Foad----------	10R	Severe	Severe	Moderate	Moderate	Slight	Western hemlock--	90	10	Sitka spruce,
							Sitka spruce-----	90	7	western hemlock.
							black cottonwood-	---	--	
Kupreanof-----	10R	Severe	Severe	Moderate	Moderate	Slight	Western hemlock--	93	10	Western hemlock
							Sitka spruce-----	92	7	Sitka spruce.
							paper birch------	---	--	
110**:										
Hollow--------	2W	Slight	Moderate	Severe	Moderate	Moderate	Black cottonwood-	73	--	Black cottonwood.
Skagway-------	2W	Slight	Moderate	Severe	Moderate	Moderate	Black cottonwood-	80	--	Black cottonwood.
111----------	8X	Slight	Severe	Severe	Slight	Slight	Sitka spruce-----	98	8	Sitka spruce,
Krubate							western hemlock--	79	10	western hemlock,
							paper birch------	---	--	paper birch
							black cottonwood-	---	--	
112----------	8X	Moderate	Severe	Severe	Slight	Slight	Sitka spruce-----	98	8	Sitka spruce,
Krubate							western hemlock--	79	10	western hemlock,
							paper birch------	---	--	paper birch
							black cottonwood-	---	--	
113----------	8R	Severe	Severe	Severe	Slight	Slight	Sitka spruce-----	98	8	Sitka spruce,
Krubate							western hemlock--	79	10	western hemlock,
							paper birch------	---	--	paper birch
							black cottonwood-	---	--	
115**:										
Kupreanof-----	10F	Slight	Moderate	Moderate	Moderate	Slight	Western hemlock--	93	10	Western hemlock,
							Sitka spruce-----	92	7	Sitka spruce.
							paper birch------	---	--	

*See Footnotes at end of table.

TABLE 5--WOODLAND MANAGEMENT AND PRODUCTIVITY—Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
115**:										
Foad----------	10A	Slight	Moderate	Moderate	Moderate	Slight	Western hemlock-- Sitka spruce----- black cottonwood-	90 90 ---	10 7 --	Sitka spruce, western hemlock.
116**:										
Kupreanof-----	10F	Moderate	Severe	Moderate	Moderate	Slight	Western hemlock-- Sitka spruce----- paper birch------	93 92 ---	10 7 --	Western hemlock, Sitka spruce.
Foad----------	10A	Moderate	Moderate	Moderate	Moderate	Slight	Western hemlock-- Sitka spruce----- black cottonwood-	90 90 ---	10 7 --	Sitka spruce, western hemlock.
117**:										
Kupreanof-----	10R	Severe	Severe	Moderate	Moderate	Slight	Western hemlock-- Sitka spruce----- paper birch------	93 92 ---	10 7 --	Western hemlock, Sitka spruce.
Foad----------	10R	Severe	Severe	Moderate	Moderate	Slight	Western hemlock-- Sitka spruce----- black cottonwood-	90 90 ---	10 7 --	Sitka spruce, western hemlock.
121**:										
Lutak---------	7A	Slight	Moderate	Moderate	Slight	Slight	Sitka spruce----- western hemlock-- black cottonwood- paper birch------	88 --- --- ---	7 -- -- --	Sitka spruce, western hemlock, black cottonwood, paper birch.
Kupreanof-----	10F	Slight	Moderate	Moderate	Moderate	Slight	Western hemlock-- Sitka spruce----- paper birch------	93 92 ---	10 7 --	Western hemlock, Sitka spruce.
122**:										
Nataga--------	8F	Slight	Moderate	Severe	Slight	Slight	Sitka spruce----- black cottonwood- western hemlock-- paper birch------	101 61 --- ---	8 -- -- --	Sitka spruce, black cottonwood, western hemlock.
Cryorthents.										
123**:										
Nataga--------	8F	Slight	Moderate	Severe	Slight	Slight	Sitka spruce----- black cottonwood- western hemlock-- paper birch------	101 61 --- ---	8 -- -- --	Sitka spruce, black cottonwood, western hemlock.
Cryorthents.										
129**:										
Rock outcrop.										
Tolstoi-------	8R	Severe	Severe	Moderate	Severe	Slight	Sitka spruce----- western hemlock--	99 87	8 10	Sitka spruce, western hemlock.
130**:										
Rock outcrop.										

*See footnotes at end of table.

TABLE 5--WOODLAND MANAGEMENT AND PRODUCTIVITY—Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
130**:										
Tolstoi-------	---	--------	--------	--------	--------	--------		---	--	
Foad----------	---	--------	--------	--------	--------	--------		---	--	
133**:										
Skagway-------	2W	Slight	Moderate	Severe	Moderate	Moderate	Black cottonwood-	80	--	Black cottonwood.
Funter.										
134**:										
Tolstoi-------	8D	Slight	Moderate	Moderate	Severe	Slight	Sitka spruce-----	99	8	Sitka spruce,
							western hemlock--	87	10	western hemlock.
Foad----------	10A	Slight	Moderate	Moderate	Moderate	Slight	Western hemlock--	90	10	Sitka spruce,
							Sitka spruce-----	90	7	western hemlock.
							black cottonwood-	---	--	
135**:										
Tolstoi-------	8R	Severe	Severe	Moderate	Severe	Slight	Sitka spruce-----	99	8	Sitka spruce,
							western hemlock--	87	10	western hemlock.
Foad----------	10A	Moderate	Moderate	Moderate	Moderate	Slight	Western hemlock--	90	10	Sitka spruce,
							Sitka spruce-----	90	7	western hemlock.
							black cottonwood-	---	--	
136**:										
Tolstoi-------	8R	Severe	Severe	Moderate	Severe	Slight	Sitka spruce-----	99	8	Sitka spruce,
							western hemlock--	87	10	western hemlock.
Foad----------	10R	Severe	Severe	Moderate	Moderate	Slight	Western hemlock--	90	10	Sitka spruce,
							Sitka spruce-----	90	7	western hemlock.
							black cottonwood-	---	--	
137**:										
Tolstoi-------	8D	Slight	Moderate	Moderate	Severe	Slight	Sitka spruce-----	99	8	Sitka spruce,
							western hemlock--	87	10	western hemlock.
Rock outcrop.										
138**:										
Tolstoi-------	8R	Severe	Severe	Moderate	Severe	Slight	Sitka spruce-----	99	8	Sitka spruce,
							western hemlock--	87	10	western hemlock.
Rock outcrop.										
139**:										
Tolstoi-------	8R	Severe	Severe	Moderate	Severe	Slight	Sitka spruce-----	99	8	Sitka spruce,
							western hemlock--	87	10	western hemlock.
Rock outcrop.										
140**:										
Tolstoi-------	8R	Severe	Severe	Moderate	Severe	Slight	Sitka spruce-----	99	8	Sitka spruce,
							western hemlock--	87	10	western hemlock.

*See footnotes at end of table.

TABLE 5--WOODLAND MANAGEMENT AND PRODUCTIVITY—Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
140**:										
Foad----------	10R	Severe	Severe	Moderate	Moderate	Slight	Western hemlock--	90	10	Sitka spruce, western hemlock.
							Sitka spruce-----	90	7	
							black cottonwood-	---	--	
141**:										
Tolstoi-------	---	--------	--------	--------	--------	--------		---	--	
Foad----------	---	--------	--------	--------	--------	--------		---	--	
Kupreanof-----	10R	Severe	Severe	Moderate	Moderate	Slight	Western hemlock--	93	10	Western hemlock, Sitka spruce.
							Sitka spruce-----	92	7	
							paper birch------	---	--	
142**:										
Tsirku--------	8W	Slight	Moderate	Moderate	Moderate	Moderate	Sitka spruce-----	95	8	black cottonwood, Sitka spruce.
							black cottonwood-	80	8	
Hollow-------- Funter.	2W	Slight	Moderate	Severe	Moderate	Moderate	black cottonwood-	73	--	black cottonwood.

* Productivity class is the yield in cubic meters per hectare per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the glossary (page 111). See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
101*:				
Ashmun	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Funter	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus.
102*:				
Ashmun	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Hollow	Severe: flooding.	Moderate: flooding, wetness, small stones.	Severe: small stones, flooding.	Moderate: wetness, flooding.
Funter	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus.
103*.				
Beaches				
104*:				
Chilkoot	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Chilkoot	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.
105.				
Cryorthents				
106*:				
Ferebee	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
Rock outcrop.				
107*:				
Foad	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Kupreanof	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

*See footnote at end of table.

TABLE 6--RECREATIONAL DEVELOPMENT—Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
108---------- Funter	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus.
109. Histic Cryaquepts				
110*:				
Hollow----------	Severe: flooding.	Moderate: flooding, wetness, small stones.	Severe: small stones, flooding.	Moderate: wetness, flooding.
Skagway----------	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.
111---------- Krubate	Severe: large stones.	Severe: large stones.	Severe: large stones, slope, small stones.	Slight.
112, 113---------- Krubate	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Severe: slope.
114---------- Krubate Variant	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: wetness, erodes easily.
115*:				
Kupreanof----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Foad----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
116*, 117*:				
Kupreanof----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Foad----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
118*: Lithic Cryofolists.				
Rock outcrop.				
Lithic Haplocryods.				
119*, 120*: Lithic Haplocryods.				
Lithic Cryofolists.				
Rock outcrop.				

*See footnote at end of table.

TABLE 6--RECREATIONAL DEVELOPMENT—Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
121*:				
Lutak----------	Slight----------	Slight----------	Moderate: slope, small stones.	Slight.
Kupreanof----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
122*:				
Nataga----------	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
Cryorthents.				
123*:				
Nataga----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Cryorthents.				
124*. Riverwash				
125*, 126*, 127*: Rock outcrop.				
Lithic Cryofolists.				
128*: Rock outcrop.				
Lithic Cryorthents.				
129*: Rock outcrop.				
Tolstoi----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
130*: Rock outcrop.				
Tolstoi----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Foad----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
131*. Rock outcrop and glaciers				
132*. Rubbleland				

*See footnote at end of table.

TABLE 6--RECREATIONAL DEVELOPMENT—Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
133*:				
Skagway	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.
Funter	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus.
134*:				
Tolstoi	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
Foad	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
135*, 136*:				
Tolstoi	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Foad	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
137*:				
Tolstoi	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
Rock outcrop.				
138*, 139*:				
Tolstoi	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Rock outcrop.				
140*:				
Tolstoi	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Foad	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
141*:				
Tolstoi	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Foad	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Kupreanof	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

*See footnote at end of table.

TABLE 6--RECREATIONAL DEVELOPMENT—Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
142*:				
Tsirku----------	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.
Hollow----------	Severe: flooding.	Moderate: flooding, wetness, small stones.	Severe: small stones, flooding.	Moderate: wetness, flooding.
Funter----------	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus.
143. Typic Cryaquods				
144, 145. Typic Haplocryods				
146*: Typic Haplocryods.				
Histic Cryaquepts.				
W*. Water				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the glossary (page 111). See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for on-site investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
101*:				
Ashmun	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
Funter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, area reclaim, wetness.
102*:				
Ashmun	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
Hollow	Fair: large stones, wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Funter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, area reclaim, wetness.
103*. Beaches				
104*:				
Chilkoot	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
Chilkoot	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, small stones.
105. Cryorthents				
106*:				
Ferebee	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, small stones, slope.
Rock outcrop.				
107*:				
Foad	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.

*See footnote at end of table.

TABLE 7--CONSTRUCTION MATERIALS—Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
107*: Kupreanof	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
108--- Funter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, area reclaim, wetness.
109. Histic Cryaquepts				
110*: Hollow	Fair: large stones, wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Skagway	Fair: wetness.	Probable	Improbable: too sandy.	Poor: small stones.
111--- Krubate	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
112, 113--- Krubate	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
114--- Krubate Variant	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
115*: Kupreanof	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Foad	Poor: depth to rock.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones.
116*, 117*: Kupreanof	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Foad	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
118*: Lithic Cryofolists.				

*See footnote at end of table.

TABLE 7--CONSTRUCTION MATERIALS—Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
118*:				
Rock outcrop.				
Lithic Haplocryods.				
119*, 120*:				
Lithic Haplocryods.				
Lithic Cryofolists.				
Rock outcrop.				
121*:				
Lutak----------	Fair: large stones.	Probable--------	Probable--------	Poor: small stones, area reclaim.
Kupreanof----------	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
122*:				
Nataga----------	Poor: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: small stones, area reclaim.
Cryorthents.				
123*:				
Nataga----------	Poor: large stones, slope.	Improbable: large stones.	Improbable: large stones.	Poor: small stones, area reclaim, slope.
Cryorthents.				
124*.				
Riverwash				
125*, 126*, 127*:				
Rock outcrop.				
Lithic Cryofolists.				
128*:				
Rock outcrop.				
Lithic Cryorthents.				
129*:				
Rock outcrop.				
Tolstoi----------	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, small stones, slope.
130*:				
Rock outcrop.				

*See footnote at end of table.

TABLE 7--CONSTRUCTION MATERIALS—Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
130*:				
Tolstoi----------	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, small stones, slope.
Foad----------	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
131*. Rock outcrop and glaciers				
132*. Rubbleland				
133*:				
Skagway----------	Fair: wetness.	Probable--------	Improbable: too sandy.	Poor: small stones.
Funter----------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, area reclaim, wetness.
134*:				
Tolstoi----------	Poor: depth to rock.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, small stones, slope.
Foad----------	Poor: depth to rock.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones.
135*, 136*:				
Tolstoi----------	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, small stones, slope.
Foad----------	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
137*:				
Tolstoi----------	Poor: depth to rock.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, small stones, slope.
Rock outcrop.				
138*, 139*:				
Tolstoi----------	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, small stones, slope.

*See footnote at end of table.

TABLE 7--CONSTRUCTION MATERIALS—Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
138*, 139*: Rock outcrop.				
140*: Tolstoi----------	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, small stones, slope.
Foad----------	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
141*: Tolstoi----------	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, small stones, slope.
Foad----------	Poor: depth to rock, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
Kupreanof----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
142*: Tsirku----------	Fair: wetness.	Probable--------	Probable--------	Poor: too sandy, area reclaim.
Hollow----------	Fair: large stones, wetness.	Probable--------	Probable--------	Poor: too sandy, small stones, area reclaim.
Funter----------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, area reclaim, wetness.
143. Typic Cryaquods				
144, 145. Typic Haplocryods				
146*: Typic Haplocryods. Histic Cryaquepts.				
W*. Water				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
101*:											
Ashmun-----	0-1	Silt loam--------	ML	A-4	0-5	95-100	95-100	90-100	70-90	---	NP
	1-7	Loamy fine sand, loamy sand, sand.	SM	A-2	0-5	90-100	85-100	55-95	15-30	---	NP
	7-60	Sand, gravelly sand, gravelly loamy fine sand.	SM	A-1, A-2	0-5	80-100	75-100	40-95	10-30	---	NP
Funter-----	0-42	Peat-------------	PT	A-8	---	---	---	---	---	---	NP
	42-60	Silt, gravelly silt loam, gravelly sandy loam.	ML, GM, SM	A-2, A-4	0-15	60-85	55-80	45-80	30-75	---	NP
102*:											
Ashmun-----	0-1	Silt loam--------	ML	A-4	0-5	95-100	95-100	90-100	70-90	---	NP
	1-7	Loamy fine sand, loamy sand, sand.	SM	A-2	0-5	90-100	85-100	55-95	15-30	---	NP
	7-60	Sand, gravelly sand, gravelly loamy fine sand.	SM	A-1, A-2	0-5	80-100	75-100	40-95	10-30	---	NP
Hollow-----	0-1	Gravelly sandy loam.	SM, GM	A-2	0-15	60-75	55-70	40-70	25-35	---	NP
	1-60	Stratified extremely gravelly sand to silt.	GP-GM, GM, SP-SM, SM	A-1	0-45	30-75	25-70	15-30	5-15	---	NP
Funter-----	0-42	Peat-------------	PT	A-8	---	---	---	---	---	---	NP
	42-60	Silt, gravelly silt loam, gravelly sandy loam.	ML, GM, SM	A-2, A-4	0-15	60-85	55-80	45-80	30-75	---	NP
103*. Beaches											
104*:											
Chilkoot---	0-5	Silt-------------	ML	A-4	0-5	95-100	95-100	95-100	80-90	---	NP
	5-60	Loamy sand, loamy fine sand, gravelly sand.	SM	A-2	0-5	80-100	75-100	60-90	10-30	---	NP
Chilkoot---	0-5	Silt-------------	ML	A-4	0-5	95-100	95-100	95-100	80-90	---	NP
	5-60	Loamy sand, loamy fine sand, gravelly sand.	SM	A-2	0-5	80-100	75-100	60-90	10-30	---	NP
105. Cryorthents											

*See footnote at end of table.

TABLE 8--ENGINEERING INDEX PROPERTIES—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
106*:											
Ferebee----	0-3	Gravelly silt loam.	SM, ML, GM	A-4	0-10	60-80	55-75	50-70	35-60	---	NP
	3-8	Very cobbly silt loam, very gravelly fine sandy loam.	GM	A-1, A-2	5-55	40-60	30-50	25-45	10-35	---	NP
	8-12	Extremely cobbly silt loam, extremely gravelly fine sandy loam.	GM	A-1, A-2	5-55	35-55	25-45	25-45	10-35	---	NP
	12-16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop											
107*:											
Foad-------	0-3	Silt loam--------	ML	A-4	0-5	80-100	75-100	70-95	55-75	---	NP
	3-30	Very gravelly silt loam, very gravelly fine sandy loam.	GM	A-1, A-2	5-55	45-60	30-50	20-50	10-35	---	NP
	30-34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kupreanof--	0-1	Silt loam--------	ML	A-4	0-5	80-100	75-100	70-95	55-75	---	NP
	1-9	Gravelly sandy loam, gravelly silt loam, sandy loam.	ML, SM, GM	A-2, A-4, A-1	0-10	65-95	55-85	40-75	20-60	---	NP
	9-60	Very gravelly coarse sandy loam, very cobbly silt loam.	SM, GM	A-2, A-4, A-1	0-15	50-70	40-60	20-50	15-40	---	NP
	22-60	Very cobbly sandy loam, extremely cobbly coarse sandy loam.	SM, GM	A-1	5-55	45-70	35-55	15-40	10-20	---	NP
108---------	0-42	Peat-------------	PT	A-8	---	---	---	---	---	---	NP
Funter	42-60	Silt, gravelly silt loam, gravelly sandy loam.	ML, GM, SM	A-2, A-4	0-15	60-85	55-80	45-80	30-75	---	NP
109. Histic Cryaquepts											
110*:											
Hollow-----	0-1	Gravelly sandy loam.	SM, GM	A-2	0-15	60-75	55-70	40-70	25-35	---	NP

*See footnote at end of table.

TABLE 8--ENGINEERING INDEX PROPERTIES—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
110*:											
Hollow-----	1-60	Stratified extremely gravelly sand to silt.	GP-GM, GM, SP-SM, SM	A-1	0-45	30-75	25-70	15-30	5-15	---	NP
Skagway----	0-2	Fine sandy loam	SM	A-4	0-5	90-100	85-100	70-85	40-45	---	NP
	2-60	Loamy fine sand, sand, gravelly loamy fine sand.	SP-SM, SM	A-2, A-1	0-5	80-100	75-100	40-95	10-30	---	NP
111, 112, 113--------- Krubate	0-3	Gravelly sandy loam.	SM	A-2, A-4	5-15	70-85	60-75	35-55	25-40	---	NP
	3-11	Very gravelly coarse sandy loam, very gravelly loamy coarse sand.	SM, GM	A-1	0-25	45-80	35-70	20-45	10-25	---	NP
	11-60	Very gravelly loamy coarse sand, extremely gravelly coarse sand.	SM, SP-SM, GM, GP-GM	A-1	0-25	40-60	25-45	10-25	5-15	---	NP
114--------- Krubate Variant	0-3	Silt loam--------	ML	A-4	0-5	95-100	95-100	85-90	70-80	---	NP
	3-5	Silt loam--------	ML	A-4	0-5	95-100	95-100	85-90	70-80	---	NP
	5-6	Silt loam--------	ML	A-4	0-5	95-100	95-100	85-90	70-80	---	NP
	6-12	Very gravelly coarse sandy loam, gravelly loamy coarse sand.	SM, GM	A-1	0-25	45-80	35-70	20-45	10-25	---	NP
	12-60	Extremely gravelly loamy coarse sand, very gravelly coarse sand.	SM, SP-SM, GM, GP-GM	A-1	0-25	40-60	25-45	10-25	5-15	---	NP
115*, 116*, 117*:											
Kupreanof--	0-3	Silt loam--------	ML	A-4	0-5	80-100	75-100	70-95	55-75	---	NP
	3-8	Gravelly sandy loam, gravelly silt loam, sandy loam.	ML, SM, GM	A-2, A-4, A-1	0-10	65-95	55-85	40-75	20-60	---	NP
	8-22	Very gravelly coarse sandy loam, very cobbly silt loam.	SM, GM	A-2, A-4, A-1	0-15	50-70	40-60	20-50	15-40	---	NP
	22-60	Very cobbly sandy loam, extremely cobbly coarse sandy loam.	SM, GM	A-1	5-55	45-70	35-55	15-40	10-20	---	NP
Foad-------	0-2	Silt loam--------	ML	A-4	0-5	80-100	75-100	70-95	55-75	---	NP

*See footnote at end of table.

TABLE 8--ENGINEERING INDEX PROPERTIES—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
115*, 116*, 117*:											
Foad-------	2-8	Silt loam, fine sandy loam, gravelly fine sandy loam.	SM, ML	A-4	0-10	75-100	60-100	50-95	35-75	---	NP
	8-23	Very gravelly silt loam, very gravelly fine sandy loam.	GM	A-1, A-2	5-55	45-60	30-50	20-50	10-35	---	NP
	23-27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
118*: Lithic Cryofolists											
Rock outcrop											
Lithic Haplocryods											
119*, 120*: Lithic Haplocryods											
Lithic Cryofolists											
Rock outcrop											
121*:											
Lutak------	0-3	Silt loam--------	ML	A-4	0	90-100	85-100	70-95	55-85	---	NP
	3-5	Sandy loam, silt loam, gravelly sandy loam.	ML, SM	A-4	0-10	85-100	75-100	55-95	35-65	---	NP
	5-8	Loamy sand, sandy loam, gravelly sandy loam.	SM	A-4, A-2	0-10	85-100	75-100	65-75	25-40	---	NP
	8-72	Very gravelly loamy sand, very gravelly sand, extremely gravelly loamy sand.	SP-SM, GP-GM, SM, GM	A-1	0-30	35-65	25-50	15-35	5-15	---	NP
Kupreanof--	0-3	Silt loam--------	ML	A-4	0-5	80-100	75-100	70-95	55-75	---	NP
	3-8	Gravelly sandy loam, gravelly silt loam, sandy loam.	ML, SM, GM	A-2, A-4, A-1	0-10	65-95	55-85	40-75	20-60	---	NP
	8-22	Very gravelly coarse sandy loam, very cobbly silt loam.	SM, GM	A-2, A-4, A-1	0-15	50-70	40-60	20-50	15-40	---	NP

*See footnote at end of table.

TABLE 8--ENGINEERING INDEX PROPERTIES—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
121*:											
Kupreanof--	22-60	Very cobbly sandy loam, extremely cobbly coarse sandy loam.	SM, GM	A-1	5-55	45-70	35-55	15-40	10-20	---	NP
122*, 123*:											
Nataga-----	0-1	Gravelly sandy loam.	SM	A-2	0-15	70-75	55-75	40-55	25-30	---	NP
	1-60	Very cobbly loamy sand, extremely cobbly loamy sand, extremely cobbly sand.	GP-GM, GM	A-1	25-55	45-55	35-50	15-35	5-15	---	NP
Cryorthents											
124*. Riverwash											
125*, 126*, 127*: Rock outcrop											
Lithic Cryofolists											
128*: Rock outcrop											
Lithic Cryorthents											
129*: Rock outcrop											
Tolstoi----	0-3	Silt loam--------	ML	A-4	0-5	85-100	85-100	70-95	50-70	---	NP
	3-15	Very gravelly silt loam, extremely cobbly silt loam.	GM	A-1, A-2	5-55	45-65	30-50	20-40	15-30	---	NP
	15-19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
130*: Rock outcrop											
Tolstoi----	0-3	Silt loam--------	ML	A-4	0-5	85-100	85-100	70-95	50-70	---	NP
	3-15	Very gravelly silt loam, extremely cobbly silt loam.	GM	A-1, A-2	5-55	45-65	30-50	20-40	15-30	---	NP

*See footnote at end of table.

TABLE 8--ENGINEERING INDEX PROPERTIES—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
130*:											
Tolstoi----	15-19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Foad-------	0-3	Silt loam--------	ML	A-4	0-5	80-100	75-100	70-95	55-75	---	NP
	3-30	Very gravelly silt loam, very gravelly fine sandy loam.	GM	A-1, A-2	5-55	45-60	30-50	20-50	10-35	---	NP
	30-34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
131*. Rock outcrop & glaciers											
132*. Rubbleland											
133*:											
Skagway----	0-2	Fine sandy loam	SM	A-4	0-5	90-100	85-100	70-85	40-45	---	NP
	2-60	Loamy fine sand, sand, gravelly loamy fine sand.	SP-SM, SM	A-2, A-1	0-5	80-100	75-100	40-95	10-30	---	NP
Funter-----	0-42	Peat-------------	PT	A-8	---	---	---	---	---	---	NP
	42-60	Silt, gravelly silt loam, gravelly sandy loam.	ML, GM, SM	A-2, A-4	0-15	60-85	55-80	45-80	30-75	---	NP
134*, 135*, 136*:											
Tolstoi----	0-2	Silt loam--------	ML	A-4	0-5	85-100	85-100	70-95	50-70	---	NP
	2-6	Gravelly silt loam, gravelly fine sandy loam, gravelly sandy loam.	GM, SM	A-2, A-4	0-5	60-80	55-75	40-70	20-50	30-40	NP-5
	6-11	Very gravelly silt loam, very cobbly sandy loam.	GM	A-2	0-30	45-65	35-60	25-55	15-35	30-40	NP-5
	11-19	Very gravelly silt loam, extremely cobbly silt loam.	GM	A-1, A-2	5-55	45-65	30-50	20-40	15-30	---	NP
	19-23	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Foad-------	0-2	Silt loam--------	ML	A-4	0-5	80-100	75-100	70-95	55-75	---	NP
	2-8	Silt loam, fine sandy loam, gravelly fine sandy loam.	SM, ML	A-4	0-10	75-100	60-100	50-95	35-75	---	NP

*See footnote at end of table.

TABLE 8--ENGINEERING INDEX PROPERTIES—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
134*, 135*, 136*:											
Foad-------	8-23	Very gravelly silt loam, very gravelly fine sandy loam.	GM	A-1, A-2	5-55	45-60	30-50	20-50	10-35	---	NP
	23-27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
137*, 138*, 139*:											
Tolstoi----	0-2	Silt loam--------	ML	A-4	0-5	85-100	85-100	70-95	50-70	---	NP
	2-6	Gravelly silt loam, gravelly fine sandy loam, gravelly sandy loam.	GM, SM	A-2, A-4	0-5	60-80	55-75	40-70	20-50	30-40	NP-5
	6-11	Very gravelly silt loam, very cobbly sandy loam.	GM	A-2	0-30	45-65	35-60	25-55	15-35	30-40	NP-5
	11-19	Very gravelly silt loam, extremely cobbly silt loam.	GM	A-1, A-2	5-55	45-65	30-50	20-40	15-30	---	NP
	19-23	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop											
140*:											
Tolstoi----	0-3	Silt loam--------	ML	A-4	0-5	85-100	85-100	70-95	50-70	---	NP
	3-15	Very gravelly silt loam, extremely cobbly silt loam.	GM	A-1, A-2	5-55	45-65	30-50	20-40	15-30	---	NP
	15-19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Foad-------	0-3	Silt loam--------	ML	A-4	0-5	80-100	75-100	70-95	55-75	---	NP
	3-30	Very gravelly silt loam, very gravelly fine sandy loam.	GM	A-1, A-2	5-55	45-60	30-50	20-50	10-35	---	NP
	30-34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
141*:											
Tolstoi----	0-2	Silt loam--------	ML	A-4	0-5	85-100	85-100	70-95	50-70	---	NP
	2-6	Gravelly silt loam, gravelly fine sandy loam, gravelly sandy loam.	GM, SM	A-2, A-4	0-5	60-80	55-75	40-70	20-50	30-40	NP-5

*See footnote at end of table.

TABLE 8--ENGINEERING INDEX PROPERTIES—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
141*:											
Tolstoi----	6-11	Very gravelly silt loam, very cobbly sandy loam.	GM	A-2	0-30	45-65	35-60	25-55	15-35	30-40	NP-5
	11-19	Very gravelly silt loam, extremely cobbly silt loam.	GM	A-1, A-2	5-55	45-65	30-50	20-40	15-30	---	NP
	19-23	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Foad-------	0-2	Silt loam--------	ML	A-4	0-5	80-100	75-100	70-95	55-75	---	NP
	2-8	Silt loam, fine sandy loam, gravelly fine sandy loam.	SM, ML	A-4	0-10	75-100	60-100	50-95	35-75	---	NP
	8-23	Very gravelly silt loam, very gravelly fine sandy loam.	GM	A-1, A-2	5-55	45-60	30-50	20-50	10-35	---	NP
	23-27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kupreanof--	0-3	Silt loam--------	ML	A-4	0-5	80-100	75-100	70-95	55-75	---	NP
	3-8	Gravelly sandy loam, gravelly silt loam, sandy loam.	ML, SM, GM	A-2, A-4, A-1	0-10	65-95	55-85	40-75	20-60	---	NP
	8-22	Very gravelly coarse sandy loam, very cobbly silt loam.	SM, GM	A-2, A-4, A-1	0-15	50-70	40-60	20-50	15-40	---	NP
	22-60	Very cobbly sandy loam, extremely cobbly coarse sandy loam.	SM, GM	A-1	5-55	45-70	35-55	15-40	10-20	---	NP
142*:											
Tsirku-----	0-1	Silt loam--------	ML, OL	A-4	0-5	90-100	85-100	80-95	65-75	---	NP
	1-41	Stratified silt to fine sand.	ML, SM	A-2, A-4	0-10	90-100	85-100	85-100	30-70	---	NP
	41-60	Extremely gravelly sand, extremely gravelly loamy sand, very cobbly sand.	SM, SP-SM, GP-GM, GM	A-1	0-45	40-65	30-50	15-30	5-15	---	NP
Hollow-----	0-1	Gravelly sandy loam.	SM, GM	A-2	0-15	60-75	55-70	40-70	25-35	---	NP
	1-60	Stratified extremely gravelly sand to silt.	GP-GM, GM, SP-SM, SM	A-1	0-45	30-75	25-70	15-30	5-15	---	NP

*See footnote at end of table.

TABLE 8--ENGINEERING INDEX PROPERTIES—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
142*:											
Funter-----	0-42	Peat----------	PT	A-8	---	---	---	---	---	---	NP
	42-60	Silt, gravelly silt loam, gravelly sandy loam.	ML, GM, SM	A-2, A-4	0-15	60-85	55-80	45-80	30-75	---	NP
143. Typic Cryaquods											
144, 145. Typic Haplocryods											
146*: Typic Haplocryods											
Histic Cryaquepts											
W*. Water											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated.)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
101*:											
Ashmun------	0-1	0-5	1.10-1.20	0.6-2.0	0.19-0.21	6.1-7.8	Low------	0.28	5	2	10-18
	1-7	0-5	1.40-1.50	6.0-20	0.04-0.06	6.6-8.4	Low------	0.17			
	7-60	0-5	1.40-1.50	6.0-20	0.04-0.06	6.6-8.4	Low------	0.17			
Funter------	0-42	0-3	0.05-0.10	6.0-20	0.80-0.90	3.6-5.5	Low------	0.05	2	8	80-90
	42-60	0-10	1.10-1.20	0.6-2.0	0.19-0.21	5.1-6.0	Low------	0.43			
102*:											
Ashmun------	0-1	0-5	1.10-1.20	0.6-2.0	0.19-0.21	6.1-7.8	Low------	0.28	5	2	10-18
	1-7	0-5	1.40-1.50	6.0-20	0.04-0.06	6.6-8.4	Low------	0.17			
	7-60	0-5	1.40-1.50	6.0-20	0.04-0.06	6.6-8.4	Low------	0.17			
Hollow------	0-1	0-5	1.10-1.20	0.6-2.0	0.14-0.16	6.1-8.4	Low------	0.17	5	6	10-18
	1-60	0-5	1.50-1.60	6.0-20	0.02-0.04	6.1-8.4	Low------	0.05			
Funter------	0-42	0-3	0.05-0.10	6.0-20	0.80-0.90	3.6-5.5	Low------	0.05	2	8	80-90
	42-60	0-10	1.10-1.20	0.6-2.0	0.19-0.21	5.1-6.0	Low------	0.43			
103*.											
Beaches											
104*:											
Chilkoot----	0-5	0-5	1.10-1.20	0.6-2.0	0.19-0.21	5.1-6.5	Low------	0.43	5	2	6-12
	5-60	0-5	1.40-1.50	6.0-20	0.04-0.06	5.1-6.5	Low------	0.17			
Chilkoot----	0-5	0-5	1.10-1.20	0.6-2.0	0.19-0.21	5.1-6.5	Low------	0.43	5	2	6-12
	5-60	0-5	1.40-1.50	6.0-20	0.04-0.06	5.1-6.5	Low------	0.17			
105.											
Cryorthents											
106*:											
Ferebee-----	0-3	0-5	1.10-1.20	0.6-2.0	0.19-0.21	3.6-5.0	Low------	0.24	1	2	4-8
	3-8	0-5	1.20-1.30	2.0-6.0	0.08-0.12	3.6-5.0	Low------	0.15			
	8-12	0-5	1.40-1.50	2.0-6.0	0.06-0.10	5.1-6.0	Low------	0.10			
	12-16	---	---	---	---	---	---------	----			
Rock outcrop.											
107*:											
Foad--------	0-3	0-5	1.10-1.20	0.6-2.0	0.19-0.21	3.6-5.5	Low------	0.28	2	2	4-8
	3-30	0-5	1.40-1.50	2.0-6.0	0.06-0.10	5.1-6.0	Low------	0.10			
	30-34	---	---	0.01-0.2	---	---	---------	----			
Kupreanof---	0-1	0-10	1.10-1.20	0.6-2.0	0.19-0.21	3.6-4.4	Low------	0.24	5	2	4-8
	1-9	0-10	1.10-1.20	0.6-2.0	0.12-0.15	3.6-5.5	Low------	0.17			
	9-60	0-10	1.30-1.40	2.0-6.0	0.06-0.10	4.5-5.5	Low------	0.15			
	22-60	0-10	1.30-1.40	2.0-6.0	0.04-0.06	5.1-5.5	Low------	0.10			
108----------	0-42	0-3	0.05-0.10	6.0-20	0.80-0.90	3.6-5.5	Low------	0.05	2	8	80-90
Funter	42-60	0-10	1.10-1.20	0.6-2.0	0.19-0.21	5.1-6.0	Low------	0.43			

*See footnote at end of table.

TABLE 9--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS—Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
109. Histic Cryaquepts											
110*:											
Hollow------	0-1	0-5	1.10-1.20	0.6-2.0	0.14-0.16	6.1-8.4	Low------	0.17	5	6	10-18
	1-60	0-5	1.50-1.60	6.0-20	0.02-0.04	6.1-8.4	Low------	0.05			
Skagway-----	0-2	0-5	1.10-1.20	0.6-2.0	0.14-0.16	6.1-8.4	Low------	0.17	5	3	10-18
	2-60	0-5	1.50-1.60	6.0-20	0.02-0.04	6.1-8.4	Low------	0.10			
111, 112, 113-	0-3	0-5	1.10-1.20	0.6-2.0	0.16-0.18	3.6-4.4	Low------	0.17	5	4	4-8
Krubate	3-11	0-5	1.30-1.40	2.0-6.0	0.06-0.10	4.5-5.5	Low------	0.15			
	11-60	0-5	1.50-1.60	2.0-6.0	0.04-0.06	5.1-6.5	Low------	0.10			
114----------	0-3	0-5	1.10-1.20	0.6-2.0	0.21-0.23	3.6-5.5	Low------	0.37	1	5	4-8
Krubate Variant	3-5	0-5	1.10-1.20	0.6-2.0	0.21-0.23	3.6-5.5	Low------	0.32			
	5-6	0-5	1.10-1.20	0.6-2.0	0.21-0.23	5.1-6.0	Low------	0.28			
	6-12	0-5	1.30-1.40	2.0-6.0	0.06-0.10	5.1-6.0	Low------	0.15			
	12-60	0-5	1.50-1.60	6.0-20	0.04-0.06	5.1-6.0	Low------	0.10			
115*, 116*, 117*:											
Kupreanof---	0-3	0-10	1.10-1.20	0.6-2.0	0.19-0.21	3.6-4.4	Low------	0.24	5	2	4-8
	3-8	0-10	1.10-1.20	0.6-2.0	0.12-0.15	3.6-5.5	Low------	0.17			
	8-22	0-10	1.30-1.40	2.0-6.0	0.06-0.10	4.5-5.5	Low------	0.15			
	22-60	0-10	1.30-1.40	2.0-6.0	0.04-0.06	5.1-5.5	Low------	0.10			
Foad--------	0-2	0-5	1.10-1.20	0.6-2.0	0.19-0.21	3.6-5.5	Low------	0.28	2	2	4-8
	2-8	0-5	1.10-1.20	0.6-2.0	0.16-0.18	5.1-6.0	Low------	0.32			
	8-23	0-5	1.40-1.50	2.0-6.0	0.06-0.10	5.1-6.0	Low------	0.10			
	23-27	---	---	0.01-0.2	---	---	---------	----			
118*: Lithic Cryofolists.											
Rock outcrop											
Lithic Haplocryods.											
119*, 120*: Lithic Haplocryods.											
Lithic Cryofolists.											
Rock outcrop											
121*:											
Lutak-------	0-3	0-5	1.10-1.20	0.6-2.0	0.19-0.21	4.5-5.5	Low------	0.32	5	2	5-10
	3-5	0-5	1.10-1.20	0.6-2.0	0.16-0.19	4.5-5.5	Low------	0.24			
	5-8	0-5	1.10-1.20	2.0-6.0	0.06-0.08	5.1-7.3	Low------	0.17			
	8-72	0-5	1.50-1.60	2.0-6.0	0.04-0.06	5.1-7.3	Low------	0.05			

*See footnote at end of table.

TABLE 9--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS—Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
121*:											
Kupreanof---	0-3	0-10	1.10-1.20	0.6-2.0	0.19-0.21	3.6-4.4	Low------	0.24	5	2	4-8
	3-8	0-10	1.10-1.20	0.6-2.0	0.12-0.15	3.6-5.5	Low------	0.17			
	8-22	0-10	1.30-1.40	2.0-6.0	0.06-0.10	4.5-5.5	Low------	0.15			
	22-60	0-10	1.30-1.40	2.0-6.0	0.04-0.06	5.1-5.5	Low------	0.10			
122*, 123*:											
Nataga------	0-1	0-5	1.10-1.20	0.6-2.0	0.14-0.16	5.1-6.5	Low------	0.17	5	3	4-8
	1-60	0-5	1.50-1.60	6.0-20	0.02-0.04	6.1-7.3	Low------	0.05			
Cryorthents.											
124*.											
Riverwash											
125*, 126*, 127*:											
Rock outcrop.											
Lithic Cryofolists											
128*:											
Rock outcrop											
Lithic Cryorthents											
129*:											
Rock outcrop											
Tolstoi-----	0-3	0-5	1.10-1.20	0.6-2.0	0.21-0.23	3.6-5.0	Low------	0.37	1	2	6-10
	3-15	0-5	1.40-1.50	2.0-6.0	0.04-0.06	5.1-6.0	Low------	0.10			
	15-19	---	---	---	---	---	---------	----			
130*:											
Rock outcrop											
Tolstoi-----	0-3	0-5	1.10-1.20	0.6-2.0	0.21-0.23	3.6-5.0	Low-----	0.37	1	2	6-10
	3-15	0-5	1.40-1.50	2.0-6.0	0.04-0.06	5.1-6.0	Low------	0.10			
	15-19	---	---	---	---	---	---------	----			
Foad--------	0-3	0-5	1.10-1.20	0.6-2.0	0.19-0.21	3.6-5.5	Low------	0.28	2	2	4-8
	3-30	0-5	1.40-1.50	2.0-6.0	0.06-0.10	5.1-6.0	Low------	0.10			
	30-34	---	---	0.01-0.2	---	---	---------	----			
131*.											
Rock outcrop and glaciers											
132*.											
Rubbleland											
133*:											
Skagway-----	0-2	0-5	1.10-1.20	0.6-2.0	0.14-0.16	6.1-8.4	Low------	0.17	5	3	10-18
	2-60	0-5	1.50-1.60	6.0-20	0.02-0.04	6.1-8.4	Low------	0.10			

*See footnote at end of table.

TABLE 9--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS—Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
133*:											
Funter------	0-42	0-3	0.05-0.10	6.0-20	0.80-0.90	3.6-5.5	Low------	0.05	2	8	80-90
	42-60	0-10	1.10-1.20	0.6-2.0	0.19-0.21	5.1-6.0	Low------	0.43			
134*, 135*, 136*:											
Tolstoi-----	0-2	0-5	1.10-1.20	0.6-2.0	0.21-0.23	3.6-5.0	Low------	0.37	1	2	6-10
	2-6	0-5	1.20-1.30	0.6-2.0	0.17-0.19	3.6-5.5	Low------	0.20			
	6-11	0-5	1.30-1.40	2.0-6.0	0.08-0.10	5.1-6.0	Low------	0.17			
	11-19	0-5	1.40-1.50	2.0-6.0	0.04-0.06	5.1-6.0	Low------	0.10			
	19-23	---	---	---	---	---	---------	----			
Foad--------	0-2	0-5	1.10-1.20	0.6-2.0	0.19-0.21	3.6-5.5	Low------	0.28	2	2	4-8
	2-8	0-5	1.10-1.20	0.6-2.0	0.16-0.18	5.1-6.0	Low------	0.32			
	8-23	0-5	1.40-1.50	2.0-6.0	0.06-0.10	5.1-6.0	Low------	0.10			
	23-27	---	---	0.01-0.2	---	---	---------	----			
137*, 138*, 139*:											
Tolstoi-----	0-2	0-5	1.10-1.20	0.6-2.0	0.21-0.23	3.6-5.0	Low------	0.37	1	2	6-10
	2-6	0-5	1.20-1.30	0.6-2.0	0.17-0.19	3.6-5.5	Low------	0.20			
	6-11	0-5	1.30-1.40	2.0-6.0	0.08-0.10	5.1-6.0	Low------	0.17			
	11-19	0-5	1.40-1.50	2.0-6.0	0.04-0.06	5.1-6.0	Low------	0.10			
	19-23	---	---	---	---	---	---------	----			
Rock outcrop.											
140*:											
Tolstoi-----	0-3	0-5	1.10-1.20	0.6-2.0	0.21-0.23	3.6-5.0	Low------	0.37	1	2	6-10
	3-15	0-5	1.40-1.50	2.0-6.0	0.04-0.06	5.1-6.0	Low------	0.10			
	15-19	---	---	---	---	---	---------	----			
Foad--------	0-3	0-5	1.10-1.20	0.6-2.0	0.19-0.21	3.6-5.5	Low------	0.28	2	2	4-8
	3-30	0-5	1.40-1.50	2.0-6.0	0.06-0.10	5.1-6.0	Low------	0.10			
	30-34	---	---	0.01-0.2	---	---	---------	----			
141*:											
Tolstoi-----	0-2	0-5	1.10-1.20	0.6-2.0	0.21-0.23	3.6-5.0	Low------	0.37	1	2	6-10
	2-6	0-5	1.20-1.30	0.6-2.0	0.17-0.19	3.6-5.5	Low------	0.20			
	6-11	0-5	1.30-1.40	2.0-6.0	0.08-0.10	5.1-6.0	Low------	0.17			
	11-19	0-5	1.40-1.50	2.0-6.0	0.04-0.06	5.1-6.0	Low------	0.10			
	19-23	---	---	---	---	---	---------	----			
Foad--------	0-2	0-5	1.10-1.20	0.6-2.0	0.19-0.21	3.6-5.5	Low------	0.28	2	2	4-8
	2-8	0-5	1.10-1.20	0.6-2.0	0.16-0.18	5.1-6.0	Low------	0.32			
	8-23	0-5	1.40-1.50	2.0-6.0	0.06-0.10	5.1-6.0	Low------	0.10			
	23-27	---	---	0.01-0.2	---	---	---------	----			
Kupnof------	0-3	0-10	1.10-1.20	0.6-2.0	0.19-0.21	3.6-4.4	Low------	0.24	5	2	4-8
	3-8	0-10	1.10-1.20	0.6-2.0	0.12-0.15	3.6-5.5	Low------	0.17			
	8-22	0-10	1.30-1.40	2.0-6.0	0.06-0.10	4.5-5.5	Low------	0.15			
	22-60	0-10	1.30-1.40	2.0-6.0	0.04-0.06	5.1-5.5	Low------	0.10			
142*:											
Tsirku------	0-1	0-5	1.10-1.20	0.6-2.0	0.19-0.21	6.1-8.4	Low------	0.28	3	2	10-18
	1-41	0-5	1.10-1.20	0.6-2.0	0.14-0.16	6.1-8.4	Low------	0.17			
	41-60	0-5	1.50-1.60	6.0-20	0.02-0.04	6.1-8.4	Low------	0.05			

*See footnote at end of table.

TABLE 9--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS—Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
142*:											
Hollow------	0-1	0-5	1.10-1.20	0.6-2.0	0.14-0.16	6.1-8.4	Low------	0.17	5	6	10-18
	1-60	0-5	1.50-1.60	6.0-20	0.02-0.04	6.1-8.4	Low------	0.05			
Funter------	0-42	0-3	0.05-0.10	6.0-20	0.80-0.90	3.6-5.5	Low------	0.05	2	8	80-90
	42-60	0-10	1.10-1.20	0.6-2.0	0.19-0.21	5.1-6.0	Low------	0.43			
143. Typic Cryaquods											
144, 145. Typic Haplocryods											
146*: Typic Haplocryods.											
Histic Cryaquepts.											
W*. Water											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10--WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
101*:							
Ashmun	D	Frequent	Long	Apr-Sep	0-1.5	Apparent	Apr-Oct
Funter	D	Frequent	Long	Apr-Sep	0-1.0	Apparent	Apr-Oct
102*:							
Ashmun	D	Frequent	Long	Apr-Sep	0-1.5	Apparent	Apr-Oct
Hollow	C	Frequent	Long	Apr-Sep	1.5-2.5	Apparent	May-Aug
Funter	D	Frequent	Long	Apr-Sep	0-1.0	Apparent	Apr-Oct
103*. Beaches							
104*:							
Chilkoot	D	Frequent	Long	Apr-Sep	0-1.0	Apparent	May-Aug
Chilkoot	D	Frequent	Long	Apr-Sep	1.0-2.0	Apparent	May-Aug
105. Cryorthents							
106*:							
Ferebee	D	None	---	---	>6.0	---	---
Rock outcrop.							
107*:							
Foad	C	None	---	---	>6.0	---	---
Kupreanof	B	None	---	---	>6.0	---	---
108 Funter	D	Frequent	Long	Apr-Sep	0-1.0	Apparent	Apr-Oct
109. Histic Cryaquepts							
110*:							
Hollow	C	Frequent	Long	Apr-Sep	1.5-2.5	Apparent	May-Aug
Skagway	C	Frequent	Long	Apr-Sep	1.5-2.5	Apparent	May-Aug
111, 112, 113 Krubate	B	None	---	---	>6.0	---	---
114 Krubate Variant	D	None	---	---	0-1.5	Apparent	May-Aug
115*, 116*, 117*:							
Kupreanof	B	None	---	---	>6.0	---	---

*See footnote at end of table.

TABLE 10--WATER FEATURES—Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
115*, 116*, 117*:							
Foad	C	None	---	---	>6.0	---	---
118*:							
Lithic Cryofolists.							
Rock outcrop.							
Lithic Haplocryods.							
119*, 120*:							
Lithic Haplocryods.							
Lithic Cryofolists.							
Rock outcrop.							
121*:							
Lutak	B	None	---	---	>6.0	---	---
Kupreanof	B	None	---	---	>6.0	---	---
122*, 123*:							
Nataga	A	None	---	---	>6.0	---	---
Cryorthents.							
124*.							
Riverwash							
125*, 126*, 127*:							
Rock outcrop.							
Lithic Cryofolists.							
128*:							
Rock outcrop.							
Lithic Cryorthents.							
129*:							
Rock outcrop.							
Tolstoi	D	None	---	---	>6.0	---	---
130*:							
Rock outcrop.							
Tolstoi	D	None	---	---	>6.0	---	---
Foad	C	None	---	---	>6.0	---	---
131*.							
Rock outcrop and glaciers							
132*.							
Rubbleland							

*See footnote at end of table.

TABLE 10--WATER FEATURES—Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
133*:							
Skagway	C	Frequent	Long	Apr-Sep	1.5-2.5	Apparent	May-Aug
Funter	D	Frequent	Long	Apr-Sep	0-1.0	Apparent	Apr-Oct
134*, 135*, 136*:							
Tolstoi	D	None	---	---	>6.0	---	---
Foad	C	None	---	---	>6.0	---	---
137*, 138*, 139*:							
Tolstoi	D	None	---	---	>6.0	---	---
Rock outcrop.							
140*:							
Tolstoi	D	None	---	---	>6.0	---	---
Foad	C	None	---	---	>6.0	---	---
141*:							
Tolstoi	D	None	---	---	>6.0	---	---
Foad	C	None	---	---	>6.0	---	---
Kupreanof	B	None	---	---	>6.0	---	---
142*:							
Tsirku	C	Frequent	Long	Apr-Sep	1.5-2.5	Apparent	May-Aug
Hollow	C	Frequent	Long	Apr-Sep	1.5-2.5	Apparent	May-Aug
Funter	D	Frequent	Long	Apr-Sep	0-1.0	Apparent	Apr-Oct
143. Typic Cryaquods							
144, 145. Typic Haplocryods							
146*: Typic Haplocryods.							
Histic Cryaquepts.							
W*. Water							

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11--SOIL FEATURES

(The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
101*:							
Ashmun	>60	---	---	---	Moderate	High	Low.
Funter	>60	---	6-12	12-24	High	High	High.
102*:							
Ashmun	>60	---	---	---	Moderate	High	Low.
Hollow	>60	---	---	---	Moderate	High	Low.
Funter	>60	---	6-12	12-24	High	High	High.
103*. Beaches							
104*:							
Chilkoot	>60	---	---	---	Moderate	Moderate	Moderate.
Chilkoot	>60	---	---	---	Moderate	Moderate	Moderate.
105. Cryorthents							
106*:							
Ferebee	7-14	Hard	---	---	High	High	High.
Rock outcrop.							
107*:							
Foad	20-40	Hard	---	---	Moderate	High	High.
Kupreanof	>60	---	---	---	Moderate	High	High.
108--- Funter	>60	---	6-12	12-24	High	High	High.
109. Histic Cryaquepts							
110*:							
Hollow	>60	---	---	---	Moderate	High	Low.
Skagway	>60	---	---	---	Moderate	High	Low.
111, 112, 113--- Krubate	>60	---	---	---	Moderate	High	High.
114--- Krubate Variant	>60	---	---	---	Moderate	High	High.
115*, 116*, 117*:							
Kupreanof	>60	---	---	---	Moderate	High	High.
Foad	20-40	Hard	---	---	Moderate	High	High.

*See footnote at end of table.

TABLE 11--SOIL FEATURES—Continued

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
118*:							
Lithic Cryofolists.							
Rock outcrop.							
Lithic Haplocryods.							
119*, 120*:							
Lithic Haplocryods.							
Lithic Cryofolists.							
Rock outcrop.							
121*:							
Lutak----------	>60	---	---	---	Moderate-------	Moderate-------	Moderate.
Kupreanof----------	>60	---	---	---	Moderate-------	High----------	High.
122*, 123*:							
Nataga----------	>60	---	---	---	Moderate-------	Moderate-------	Moderate.
Cryorthents.							
124*.							
Riverwash							
125*, 126*, 127*:							
Rock outcrop.							
Lithic Cryofolists.							
128*:							
Rock outcrop.							
Lithic Cryorthents.							
129*:							
Rock outcrop.							
Tolstoi----------	14-20	Hard	---	---	Moderate-------	High----------	High.
130*:							
Rock outcrop.							
Tolstoi----------	14-20	Hard	---	---	Moderate-------	High----------	High.
Foad----------	20-40	Hard	---	---	Moderate-------	High----------	High.
131*.							
Rock outcrop and glaciers							
132*.							
Rubbleland							
133*:							
Skagway----------	>60	---	---	---	Moderate-------	High----------	Low.

*See footnote at end of table.

TABLE 11--SOIL FEATURES—Continued

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
133*:							
Funter	>60	---	6-12	12-24	High	High	High.
134*, 135*, 136*:							
Tolstoi	14-20	Hard	---	---	Moderate	High	High.
Foad	20-40	Hard	---	---	Moderate	High	High.
137*, 138*, 139*:							
Tolstoi	14-20	Hard	---	---	Moderate	High	High.
Rock outcrop.							
140*:							
Tolstoi	14-20	Hard	---	---	Moderate	High	High.
Foad	20-40	Hard	---	---	Moderate	High	High.
141*:							
Tolstoi	14-20	Hard	---	---	Moderate	High	High.
Foad	20-40	Hard	---	---	Moderate	High	High.
Kupreanof	>60	---	---	---	Moderate	High	High.
142*:							
Tsirku	>60	---	---	---	High	High	Low.
Hollow	>60	---	---	---	Moderate	High	Low.
Funter	>60	---	6-12	12-24	High	High	High.
143. Typic Cryaquods							
144, 145. Typic Haplocryods							
146*: Typic Haplocryods.							
Histic Cryaquepts.							
W*. Water							

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See the text for a description of those characteristics of the soil that are outside the range of the series.)

Soil name	Family or higher taxonomic class
Ashmun	Sandy, mixed Typic Cryaquents
Chilkoot	Sandy, mixed Typic Cryaquents
Ferebee	Loamy-skeletal, mixed Lithic Ruptic-Entic Cryumbrepts
*Foad	Loamy-skeletal, mixed Typic Humicryods
Funter	Loamy, mixed, euic, frigid Terric Sphagnofibrists
Hollow	Sandy-skeletal, mixed Typic Cryofluvents
Krubate	Sandy-skeletal, mixed Typic Humicryods
Krubate Variant	Sandy-skeletal, mixed Sideric Cryaquods
*Kupreanof	Loamy-skeletal, mixed Typic Humicryods
Lutak	Sandy-skeletal, mixed Typic Haplocryods
Nataga	Sandy-skeletal, mixed Typic Cryorthents
Skagway	Mixed Typic Cryopsamments
*Tolstoi	Loamy-skeletal, mixed Lithic Humicryods
Tsirku	Coarse-loamy, mixed (calcareous) Typic Cryofluvents

TABLE 13—SCIENTIFIC NAMES OF PLANTS MENTIONED IN THE TEXT AND TABLES

Common Name	Scientific Name
TREES	
black cottonwood	Populus balsamifern ssp. trichocarpa (Torr. & Gray ex Hook.) Brayshaw
lodgepole pine	Pinus contorta Dougl. ex Loud.
mountain hemlock	Tsuga mertensiana (Bong.) Carr.
paper birch	Betula papyrifera Marsh.
quaking aspen	Populus tremuloides Michx.
Sitka spruce	Picea sitchensis (Bong.) Carr.
western hemlock	Tsuga heterophylla (Raf.) Sarg.
SHRUBS	
alder	Alnus spp. P. Mill.
bog blueberry	Vaccinium uliginosum L.
bog cranberry	Vaccinium oxycoccos L.
bog birch	Betula nana L.
bristly black currant	Ribes laxiflorum Pursh
cranberry	Vaccinium spp. L.
crowberry	Empetrum nigrum
currant	Ribes spp. L.
devil's club	Oplopanax horridus Miq.
Douglas maple	Acer glabrum var. douglasii (Hook.) Dippel
early blueberry	Vaccinium ovalifolium Sm.
highbush cranberry	Viburnum edule (Michx.) Raf.
prickly currant	Ribes lacustre (Pers.) Polr.
red-osier dogwood	Cornus stolonifera Michx.
rose	Rosa spp. L.
russet buffaloberry	Shepherdia canadensis (L.) Nutt.
rusty menziesia	Menziesia ferruginea Sm.
salmonberry	Rubus spectabilis Pursh
Sitka alder	Alnus sinuata (Regel) Rydb.
western thimbleberry	Rubus parviflorus Nutt.
willow	Salix spp. L.
FORBS	
arctic starflower	Trientalis arctica L.
bunchberry dogwood	Cornus canadensis L.
five-leaf bramble	Rubus pedatus Sm.
horsetail	Equisetum spp. L.
liver-leaf wintergreen	Pyrola asarifolia Michx.
meadow horsetail	Equisetum pratense Ehrh.
one-sided wintergreen	Pyrola secunda L.
red baneberry	Actaea rubra (Ait.) Willd.
single delight	Moneses uniflora (L.) Gray
trifoliate foam flower	Tiarella trifoliata L.
twisted-stalk	Streptopus amplexifolius (L.) DC.
wintergreen	Pyrola spp. L.
FERNS	
alpine ladyfern	Athyrium filix-femina (L.) Roth
oakfern	Gymnocarpium dryopteris (L.) Newman
spinulose shield-fern	Dryopteris dilatata auct. non (Hoffmann) Gray
GRASSES AND SEDGES	
reed grass	Calamagrostis spp. Adans.
sedge	Carex spp. L.
HERBS	
rattlesnake plantain	Goodyera oblongifolia Raf.
sweet-scented bedstraw	Galium triflorum Michx.
mountain avens	Dryas drummondii Richards. ex Hook.
bluntseed sweetroot	Osmorhiza depauperata Phil.
nagoonberry	Rubus arcticus L.

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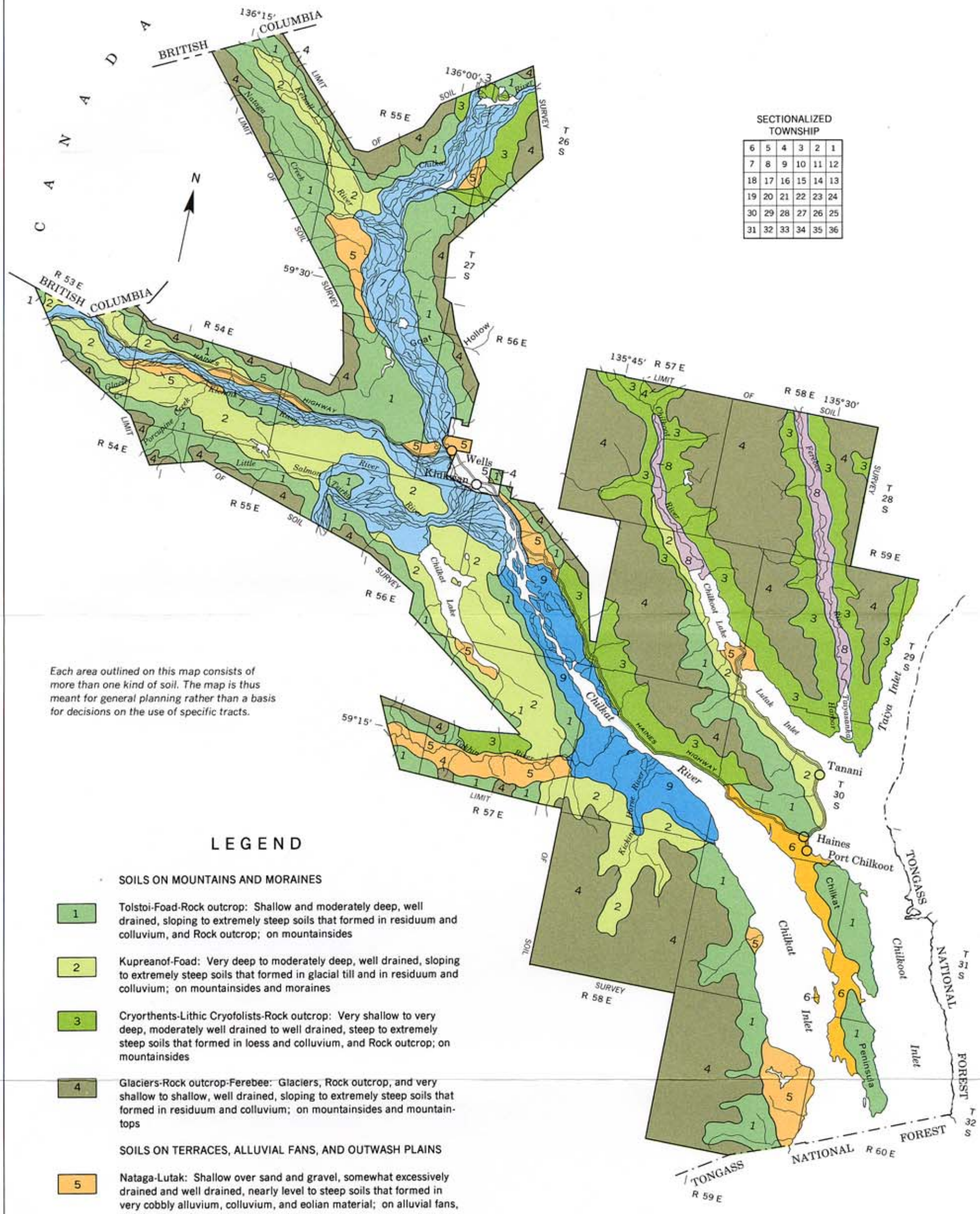


Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

LEGEND

SOILS ON MOUNTAINS AND MORAINES

1 Tolstoi-Foad-Rock outcrop: Shallow and moderately deep, well drained, sloping to extremely steep soils that formed in residuum and colluvium, and Rock outcrop; on mountainsides

2 Kupreanof-Foad: Very deep to moderately deep, well drained, sloping to extremely steep soils that formed in glacial till and in residuum and colluvium; on mountainsides and moraines

3 Cryorthents-Lithic Cryofolists-Rock outcrop: Very shallow to very deep, moderately well drained to well drained, steep to extremely steep soils that formed in loess and colluvium, and Rock outcrop; on mountainsides

4 Glaciers-Rock outcrop-Ferebee: Glaciers, Rock outcrop, and very shallow to shallow, well drained, sloping to extremely steep soils that formed in residuum and colluvium; on mountainsides and mountaintops

SOILS ON TERRACES, ALLUVIAL FANS, AND OUTWASH PLAINS

5 Nataga-Lutak: Shallow over sand and gravel, somewhat excessively drained and well drained, nearly level to steep soils that formed in very cobbly alluvium, colluvium, and eolian material; on alluvial fans, toe slopes, and stream terraces

6 Krubate-Typic Haplocryods-Histic Cryaquepts: Very deep, well drained to poorly drained, sloping to very steep soils that formed in glaciofluvial deposits; on outwash plains

SOILS ON FLOOD PLAINS

7 Hollow-Skagway-Funter: Very deep, somewhat poorly drained and very poorly drained, nearly level soils that formed in calcareous alluvium and fibrous peat; on flood plains

8 Chilkoot: Very deep, very poorly drained and poorly drained, nearly level soils that formed in sandy alluvium; on flood plains

9 Ashmun-Funter-Hollow: Very deep, very poorly drained and somewhat poorly drained, nearly level soils that formed in calcareous alluvium and fibrous peat; on flood plains

COMPILED 1985

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
UNIVERSITY OF ALASKA
AGRICULTURAL AND FORESTRY EXPERIMENT STATION
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES

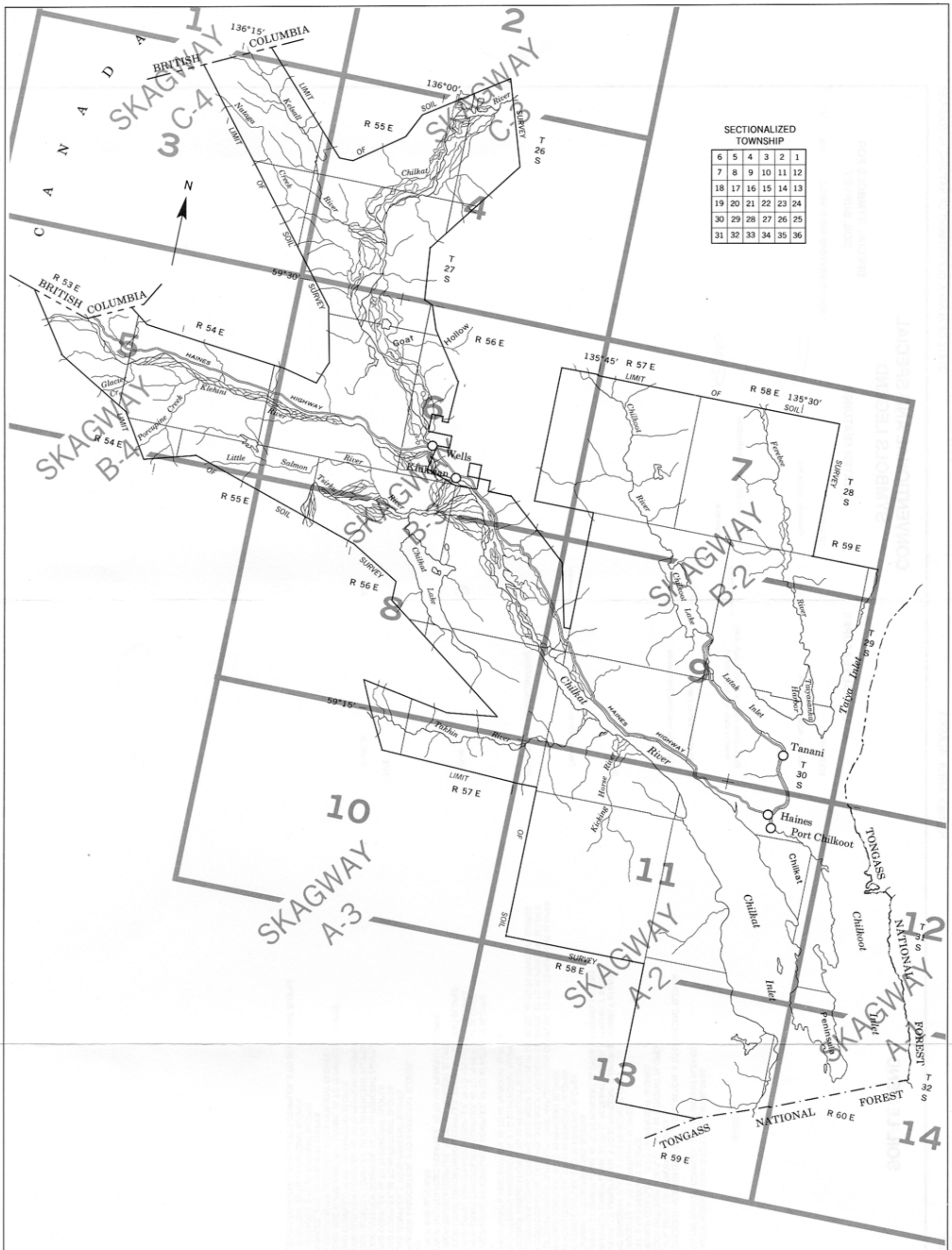
GENERAL SOIL MAP

HAINES AREA, ALASKA

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km



INDEX TO MAP SHEETS

HAINES AREA, ALASKA

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

SOIL LEGEND

SYMBOL	NAME
101	ASHMUN-FUNTER ASSOCIATION, 0 TO 5 PERCENT SLOPES
102	ASHMUN-HOLLOW-FUNTER COMPLEX, 0 TO 5 PERCENT SLOPES
103	BEACHES
104	CHILKOOT-CHILKOOT, MODERATELY WET, ASSOCIATION, 0 TO 5 PERCENT SLOPES
105	CRYORTHENTS, 20 TO 180 PERCENT SLOPES
106	FEREBEE-ROCK OUTCROP COMPLEX, 5 TO 90 PERCENT SLOPES
107	FOAD-KUPREANOF COMPLEX, 70 TO 100 PERCENT SLOPES
108	FUNTER PEAT, 0 TO 5 PERCENT SLOPES
109	HISTIC CRYAQUEPTS, 0 TO 20 PERCENT SLOPES
110	HOLLOW AND SKAGWAY SOILS, 0 TO 5 PERCENT SLOPES
111	KRUBATE GRAVELLY SANDY LOAM, 5 TO 20 PERCENT SLOPES, EXTREMELY STONY
112	KRUBATE GRAVELLY SANDY LOAM, 20 TO 40 PERCENT SLOPES, EXTREMELY STONY
113	KRUBATE GRAVELLY SANDY LOAM, 40 TO 70 PERCENT SLOPES, EXTREMELY STONY
114	KRUBATE VARIANT, 0 TO 20 PERCENT SLOPES
115	KUPREANOF-FOAD COMPLEX, 2 TO 20 PERCENT SLOPES
116	KUPREANOF-FOAD COMPLEX, 20 TO 40 PERCENT SLOPES
117	KUPREANOF-FOAD COMPLEX, 40 TO 70 PERCENT SLOPES
118	LITHIC CRYOFOLISTS-ROCK OUTCROP-LITHIC HAPLOCRYODS COMPLEX, 70 TO 120 PERCENT SLOPES
119	LITHIC HAPLOCRYODS-LITHIC CRYOFOLISTS-ROCK OUTCROP COMPLEX, 20 TO 40 PERCENT SLOPES
120	LITHIC HAPLOCRYODS-LITHIC CRYOFOLISTS-ROCK OUTCROP COMPLEX, 40 TO 70 PERCENT SLOPES
121	LUTAK-KUPREANOF ASSOCIATION, 0 TO 20 PERCENT SLOPES
122	NATAGA-CRYORTHENTS ASSOCIATION, 0 TO 20 PERCENT SLOPES
123	NATAGA-CRYORTHENTS ASSOCIATION, 20 TO 40 PERCENT SLOPES
124	RIVERWASH
125	ROCK OUTCROP-LITHIC CRYOFOLISTS COMPLEX, 20 TO 40 PERCENT SLOPES
126	ROCK OUTCROP-LITHIC CRYOFOLISTS COMPLEX, 40 TO 70 PERCENT SLOPES
127	ROCK OUTCROP-LITHIC CRYOFOLISTS COMPLEX, 70 TO 120 PERCENT SLOPES
128	ROCK OUTCROP-LITHIC CRYORTHENTS COMPLEX, 70 TO 120 PERCENT SLOPES
129	ROCK OUTCROP-TOLSTOI COMPLEX, 70 TO 100 PERCENT SLOPES
130	ROCK OUTCROP-TOLSTOI-FOAD COMPLEX, 70 TO 100 PERCENT SLOPES
131	ROCK OUTCROP AND GLACIERS
132	RUBBLELAND
133	SKAGWAY-FUNTER ASSOCIATION, 0 TO 5 PERCENT SLOPES
134	TOLSTOI-FOAD COMPLEX, 5 TO 20 PERCENT SLOPES
135	TOLSTOI-FOAD COMPLEX, 20 TO 40 PERCENT SLOPES
136	TOLSTOI-FOAD COMPLEX, 40 TO 70 PERCENT SLOPES
137	TOLSTOI-ROCK OUTCROP COMPLEX, 10 TO 20 PERCENT SLOPES
138	TOLSTOI-ROCK OUTCROP COMPLEX, 20 TO 40 PERCENT SLOPES
139	TOLSTOI-ROCK OUTCROP COMPLEX, 40 TO 70 PERCENT SLOPES
140	TOLSTOI-FOAD COMPLEX, 70 TO 100 PERCENT SLOPES
141	TOLSTOI, FOAD, AND KUPREANOF SILT LOAMS, 20 TO 70 PERCENT SLOPES
142	TSIRKU-HOLLOW-FUNTER COMPLEX, 0 TO 5 PERCENT SLOPES
143	TYPIC CRYAQUODS, 0 TO 20 PERCENT SLOPES
144	TYPIC HAPLOCRYODS, 5 TO 20 PERCENT SLOPES
145	TYPIC HAPLOCRYODS, 20 TO 40 PERCENT SLOPES
146	TYPIC HAPLOCRYODS-HISTIC CRYAQUEPTS COMPLEX, 5 TO 20 PERCENT SLOPES
W	WATER

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

National, state, or province

Reservation (national forest or park, state forest or park, and large airport)

Limit of soil survey (label)

Field sheet matchline and neatline

ROADS

County, farm or ranch

ROAD EMBLEM & DESIGNATIONS

State (52)

PITS

Gravel pit

WATER FEATURES

DRAINAGE

Perennial, double line

LAKES, PONDS AND RESERVOIRS

Perennial

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS 105 141

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 1

N

136°07'30"
59°45'00"

59°37'30"
136°30'00"

T. 26 S.

R. 54 E. | R. 55 E.

(Joins sheet 3)

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 3/4 1/2 1/4 0 1 2 3 MILES
1 0.5 0 1 2 3 4 KILOMETERS

SCALE 1:31 680

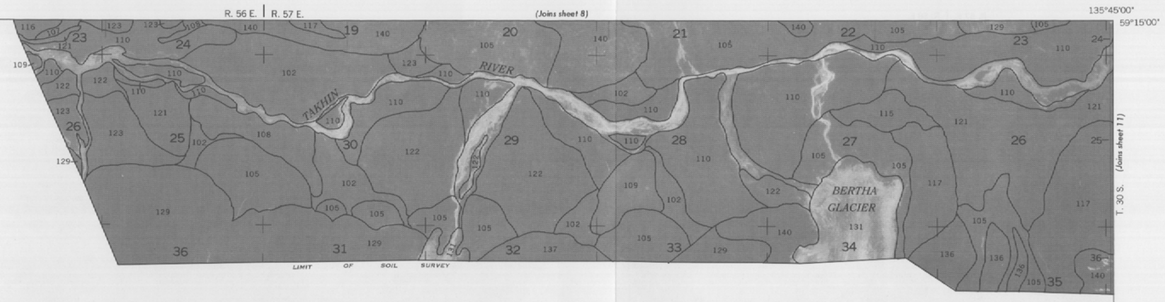
HAINES AREA ALASKA NO. 1

SHEET NO. 1 OF 14

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 10

10
N



59°07'30"
136°07'30"

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1 3/4 1/2 1/4 0 1 2 3 MILES
1 0.5 0 1 2 3 4 KILOMETERS

SCALE 1:31 680

HAINES AREA ALASKA NO. 10

SHEET NO.10 OF 14

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 11

11
N

R. 57 E. | R. 58 E. | R. 59 E. | R. 60 E.
135°22'30"
59°15'00"
59°07'30"
135°45'00"
T. 30 S. | T. 31 S. | T. 32 S.

(Joins sheet 9)
(Joins sheet 10)
(Joins sheet 12)
(Joins sheet 13)

CHILKAT RIVER
MCCLELLAN FLATS
CHILKOOT INLET
CHILKAT PENINSULA
CHILKAT INLET
Haines
Portage Cove
Port Chilkoot
Chilkat
Pyramid Harbor
Letnikof Cove
Kochu Island
Kicking Horse River
GARRISON GLACIER
RAINBOW GLACIER
HAINES HIGHWAY
AIRPORT LANDING STRIP
LIMIT OF SOIL SURVEY

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1 3/4 1/2 1/4 0 1 2 3 MILES
1 0.5 0 1 2 3 4 KILOMETERS
SCALE 1:31 680

HAINES AREA ALASKA NO. 11

SHEET NO. 11 OF 14

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 12

12
N

135°00'00"
59°15'00"

T. 31 S. | T. 30 S.

Kelgaya Point
Kelgaya Bay
Battery Point
CHILKOOT INLET
CHILKAT PENINSULA
Flat Bay
road
water
(Joins sheet 11)
(Joins sheet 14)
R. 60 E.
T. 32 S. | T. 31 S.
59°07'30"
135°22'30"

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1 3/4 1 2 1/4 0 1 2 3 MILES
1 0 5 0 1 2 3 4 KILOMETERS
SCALE 1:31 680
HAINES AREA ALASKA NO. 12

SHEET NO.12 OF 14

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 13

13

N

R. 58 E. | R. 59 E. | R. 59 E. | R. 60 E. 135°22'30"

59°07'30"

(Joins sheet 11)

RAINBOW GLACIER

CHILKAT INLET

Glacier Point

water

DAVIDSON GLACIER

Glacier River

CHILKAT INLET

T. 32 S.

(Joins sheet 14)

LIMIT OF SOIL SURVEY

59°00'00"

135°45'00"

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1 3/4 1/2 1/4 0 1 2 3 MILES

1 0.5 0 1 2 4 KILOMETERS

SCALE 1:31 680

HAINES AREA ALASKA NO. 13

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 14

14
N

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1 3/4 1/2 1/4 0 1 2 3 MILES
1 0.5 0 1 2 3 4 KILOMETERS
SCALE 1:31 680

HAINES AREA ALASKA NO. 14

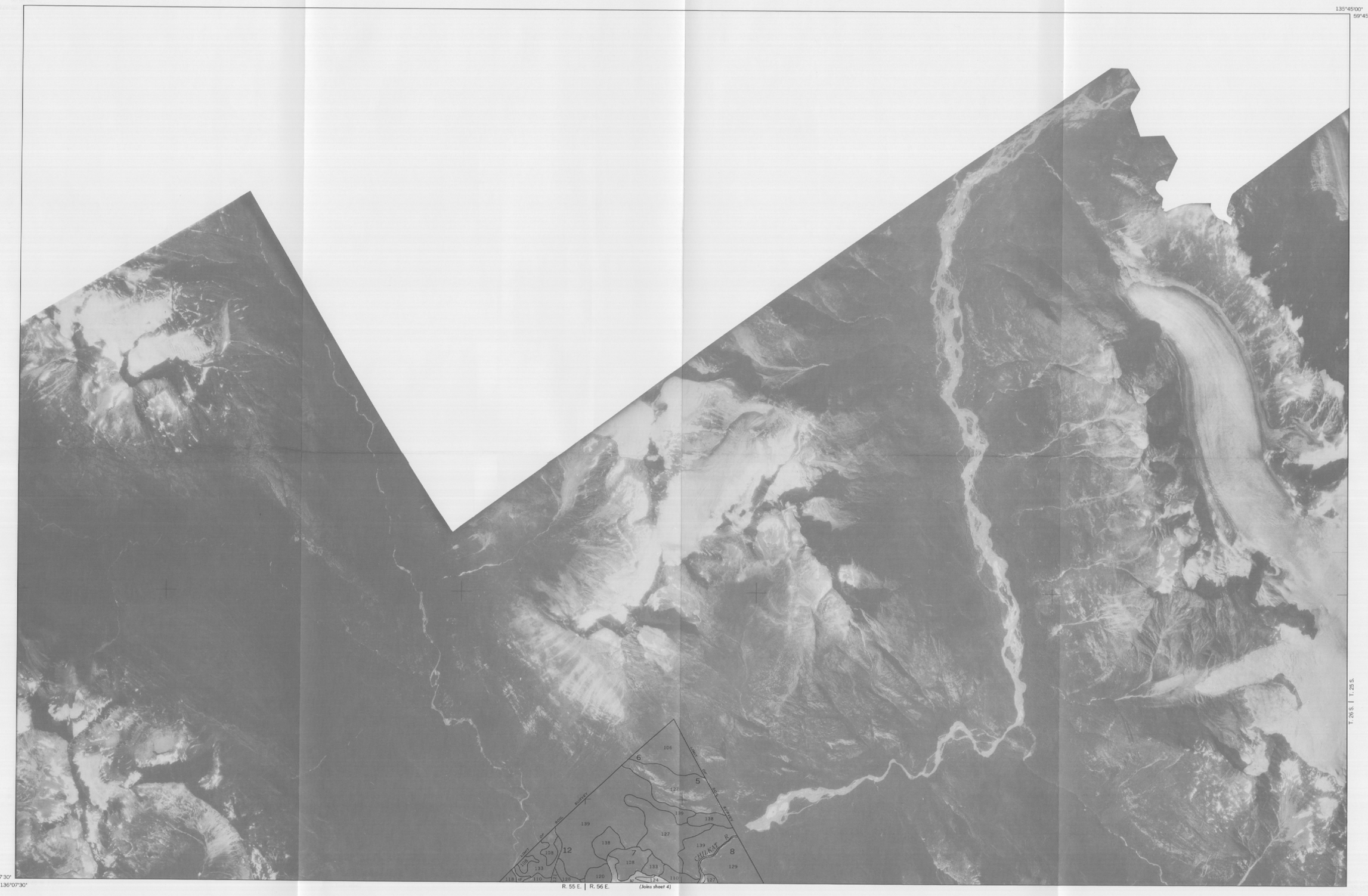
SHEET NO.14 OF 14

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 2

2
N

135°45'00"
59°45'00"



T. 26 S.
T. 25 S.

59°37'30"
136°07'30"

R. 55 E. | R. 56 E.

(Joins sheet 4)

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1 3/4 1/2 1/4 0 1 2 3 MILES
1 0.5 0 1 2 3 4 KILOMETERS

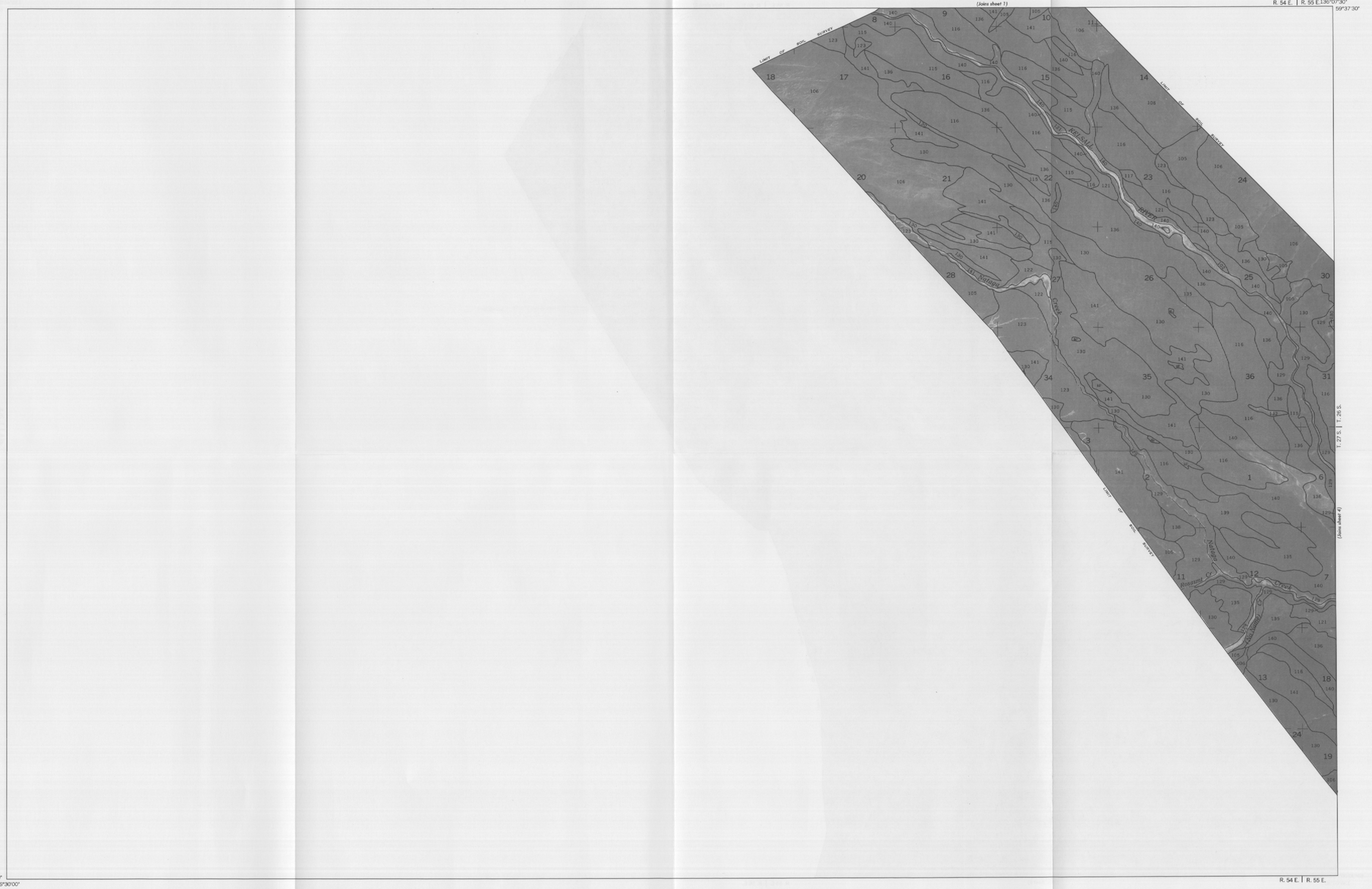
SCALE 1:31,680

HAINES AREA ALASKA NO. 2

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 3

3
N



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1 3/4 1/2 1/4 0 1 2 3 MILES
1 0.5 0 1 2 3 4 KILOMETERS
SCALE 1:31 680
HAINES AREA ALASKA NO. 3

SHEET NO. 3 OF 14

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 4

4
N

R. 55 E. | R. 56 E. (Joins sheet 2)

135°45'00"
59°37'30"

T. 27 S. | T. 26 S.

(Joins sheet 3)

59°30'00"
136°07'30"

(Joins sheet 6)

R. 55 E. | R. 56 E.

LIMIT OF SOIL SURVEY

CHILKAT RIVER

KELSALL RIVER

Nataga Creek

water

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1 3/4 1/2 1/4 0 1 2 3 MILES
1 0.5 0 1 2 3 4 KILOMETERS

SCALE 1:31 680

HAINES AREA ALASKA NO. 4

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 5

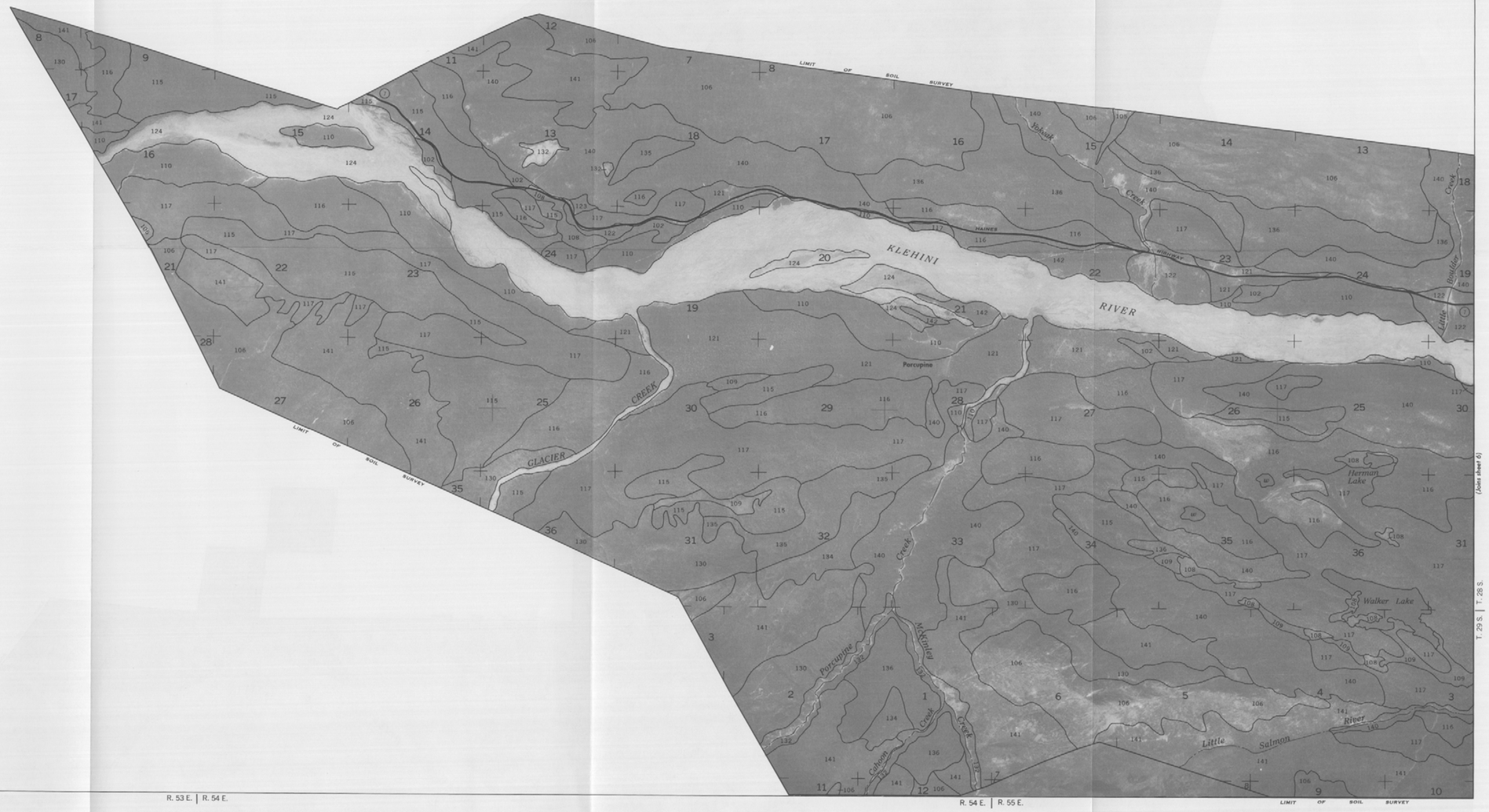
5
N

R. 53 E. | R. 54 E.

R. 54 E. | R. 55 E.

136°07'30"

59°30'00"



59°22'30"

136°30'00"

R. 53 E. | R. 54 E.

R. 54 E. | R. 55 E.

T. 29 S. | T. 28 S.

(Adds sheet 6)

Sheet 5

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1 3/4 1/2 1/4 0 1 2 3 MILES

1 0.5 0 1 2 3 4 KILOMETERS

SCALE 1:31 680

HAINES AREA ALASKA NO. 5

SHEET NO. 5 OF 14

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 6

6

N

R. 55 E. | R. 56 E.

R. 56 E. | R. 57 E.

135°45'00"

59°30'00"

T. 28 S. | T. 27 S.

T. 29 S. | T. 28 S.

(Joins sheet 4)

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 8)

59°22'30"

136°07'30"

CHILKAT RIVER

KLEHINI RIVER

TSIRKU RIVER

Mosquito Lake

Mumpeter Creek

Little Salmon River

HAINES HIGHWAY

LIMIT OF SOIL SURVEY

water

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 3/4 1/2 1/4 0 1 2 3 MILES

1 0.5 0 1 2 3 4 KILOMETERS

SCALE 1:31 680

HAINES AREA ALASKA NO. 6

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 7

7
N

R. 57 E. | R. 58 E.

R. 58 E. | R. 59 E.

135°22'30"
59°30'00"

LIMIT OF SOIL SURVEY

CHILKOOT RIVER

CHILKAT RIVER

FERRIBEE RIVER

Mount Kashagnak

water

(Joins sheet 6)

T. 29 S. | T. 28 S.

59°22'30"
135°45'00"

R. 57 E. | R. 58 E.

R. 58 E. | R. 59 E.

(Joins sheet 9)

R. 59 E. | R. 60 E.

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1 3/4 1/2 1/4 0 1 2 3 MILES
1 0.5 0 1 2 3 4 KILOMETERS

SCALE 1:31 680

HAINES AREA ALASKA NO. 7

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 8

N

135°45'00"
59°22'30"
59°15'00"
136°07'30"

R. 55 E. | R. 56 E.
R. 56 E. | R. 57 E.

T. 30 S. | T. 29 S.

(Joins sheet 6)
(Joins sheet 9)
(Joins sheet 10)

TSIRKU RIVER
TSIRKU
RIVER
CHILKAT LAKE
CHILKAT RIVER
Ammon Creek
HAINES
water

LIMIT OF SOIL SURVEY

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1 3/4 1/2 1/4 0 1 2 3 MILES
1 0.5 0 1 2 3 4 KILOMETERS

SCALE 1:31 680

HAINES AREA ALASKA NO. 8

SHEET NO. 8 OF 14

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF
HAINES AREA, ALASKA
SHEET NUMBER 9

9
N

R. 57 E. | R. 58 E. | R. 58 E. | R. 59 E. (Joins sheet 7) | R. 59 E. | R. 60 E.

135°22'30"
59°22'30"

T. 30 S. | T. 29 S.

(Joins sheet 8)

CHILKOOT LAKE

CHILKAT RIVER

LUTAK INLET

TAIYA INLET

CHILKOOT INLET

FERRBEE RIVER

Chilkoot

Taiyasanka Harbor

Tanani

Tanani Bay

HAINES HIGHWAY 142

TAKHIN RIVER

Kicking Horse River

59°15'00"
135°45'00"

R. 57 E. | R. 58 E. (Joins sheet 11) R. 58 E. | R. 59 E.

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1 3/4 1/2 1/4 0 1 2 3 MILES
1 0.5 0 1 2 3 4 KILOMETERS

SCALE 1:31 680

HAINES AREA ALASKA NO. 9